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The Metallic Steam Check.

The Metallic Steam Check, which is shown as applied in practice, in four of the engravings upon this page, is designed as a reliable, durable, and economical device for preventing the escape of steam and water around piston-rods, valve-stems, pump-rods or plungers. It is an efficient substitute for the various forms and applications of soft packing.

Fig. 1 is an elevation showing cylinder head, with steam check attached. The plate *A*, represents the cylinder head, with check applied without stuffing-box. *C*, is the cylinder enclosing the check, as shown in *C*, Fig. 2. *L*, is the outer plate held down by the bolts *M M*, upon the cylinder *C*, sufficiently tight to allow lateral motion, which may occur. Fig. 2 is a horizontal section of check *C*, showing cylinder; *G*, space between cylinder and check; *D*, composition metal; *E E*, Babbitt metal; *B*, piston-rod.

Fig. 3 is a perpendicular section; *B*, the piston-rod; *J J*, plates recessed to receive the plates or rings, *C H*; *E E*, Babbitt metal; *D*, composition. The recess *D*, in ring *C*, is for the purpose of using soft packing when the rods are not perfect, keeping them tight until the metal is worn to fit; *A A*, cylinder; *K K*, bolts.

Fig. 4 is a perspective view, with the check open, showing the internal construction and arrangement; *A*, piston-rod; *C C*, composition; *B B*, Babbitt metal.

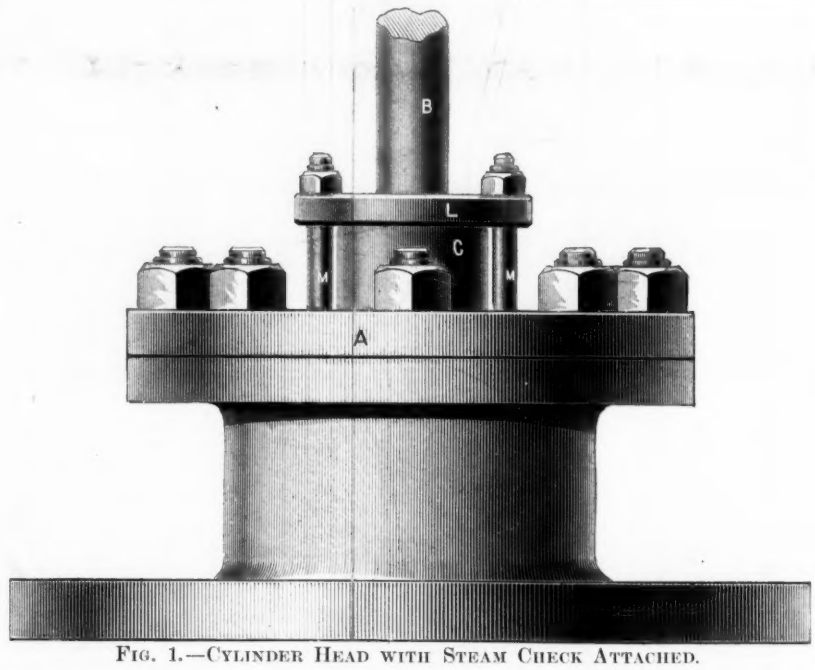


FIG. 1.—CYLINDER HEAD WITH STEAM CHECK ATTACHED.

The steam check can be applied to engines in use, provided with the ordinary stuffing-boxes, without delay.

The following are the special *points of excellence* claimed for this steam check:

1. The packing is applied *outside* of the cylinder; it is entirely independent of the stuffing-box, of which there is no farther need, so far as packing is concerned; the plate which attaches it to the cylinder is bolted to the flange, exactly as the gland plate—which it takes the place of. It is, therefore, *in full view*.

2. It bears equally on all sides of the rod, and must, therefore, always wear it *round*.

3. It reduces friction to a minimum—there is next to *no pressure on the rod;* as an ascertained fact, an engine will make many more turns after shutting off the steam with this than with any soft packing.

4. It is always *positive*, never varying, always remaining where the engineer has adjusted it, and as its conditions never change, its operation is regular and reliable.

5. It is, in one sense, a part of the piston-rod, for although the flange plate is securely fastened to the cylinder, the ring is capable of a lateral movement, sliding on the plate, the hole in the *plate* being a little larger than the rod; the ring, therefore, accommodates itself to the sidewise motion or vibration of the rod, if, as often happens, it does not run exactly in the line of the axis of the cylinder. This is an entirely new feature in piston-rod packing. It does not offer the slightest resistance to the vibratory motion of the rod, but moves with it, easily and freely, yet preserving a tight joint. No grit or other hard substance can adhere to it, and there is no unequal pressure to groove the rod or flatten it; the gumming of the piston-rod, pertaining to all soft packings, is entirely obviated.

For the above reasons it is extremely durable, not liable to be broken or disarranged. It requires little attention, and causes no trouble. Owing to its simplicity of construction it is comparatively inexpensive It has gained some very high indorsements from practical engineers who have given it a trial.

The manufacturers are the Hancock Inspirator Co., 34 Beach St., Boston, Mass., and 35 Queen Victoria St., London, England.

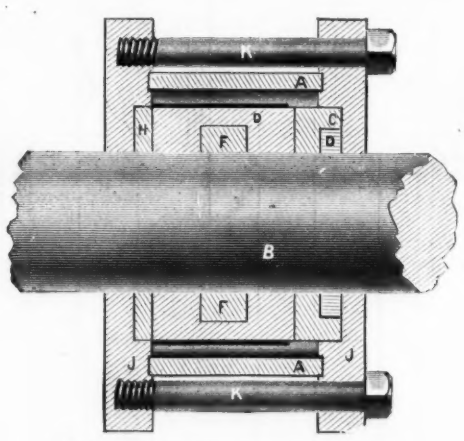


FIG. 3.—PERPENDICULAR SECTION.

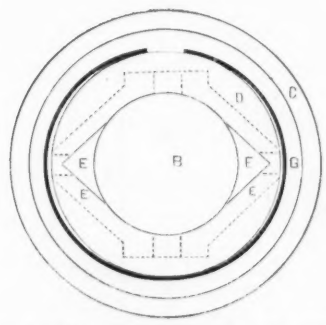


FIG. 2.—CYLINDER ENCLOSING CHECK.

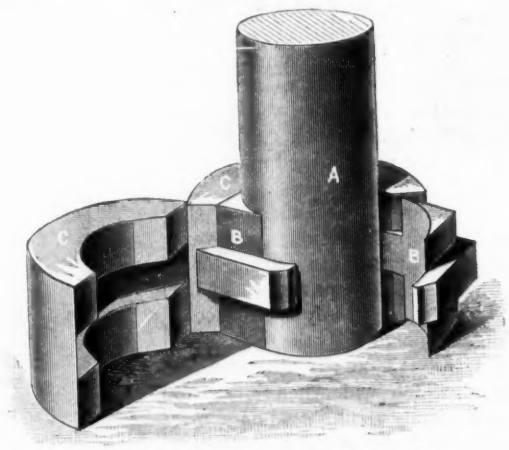
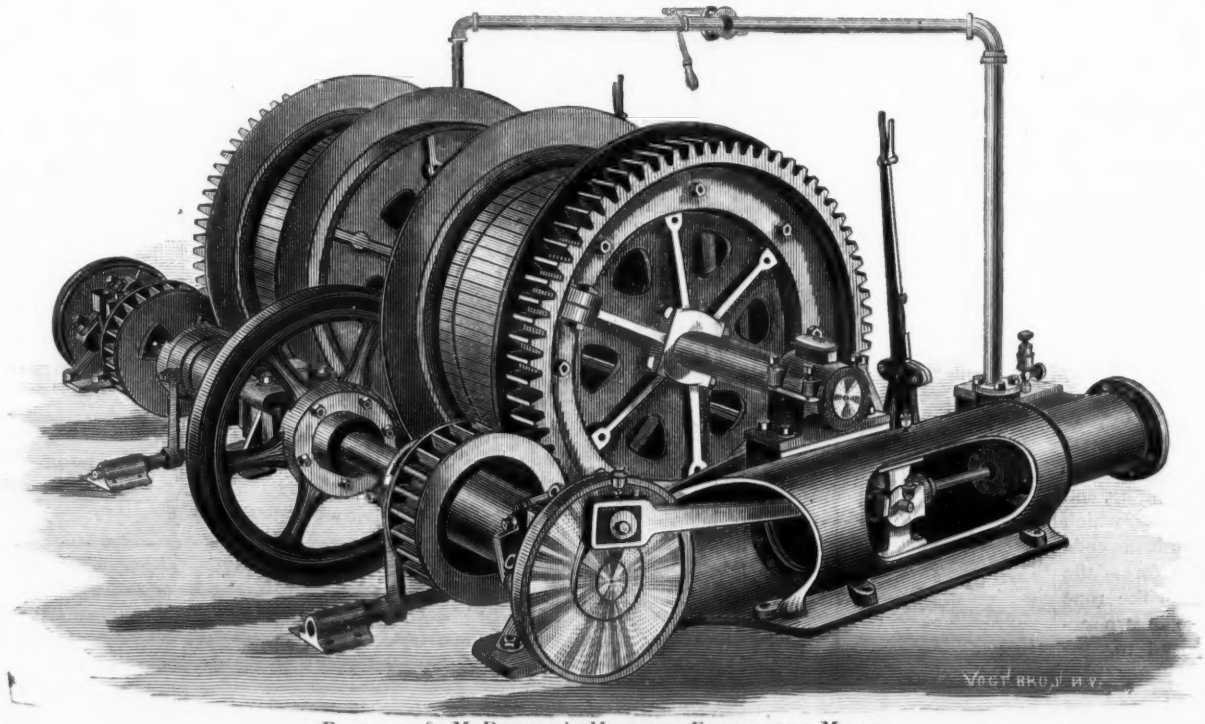


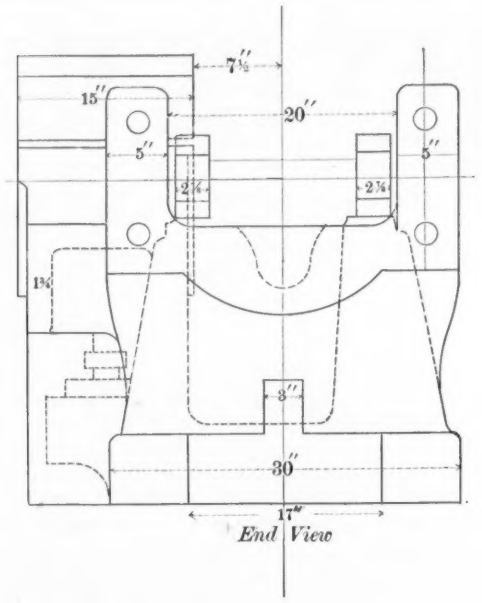
FIG. 4.—PERSPECTIVE VIEW, CHECK OPEN.



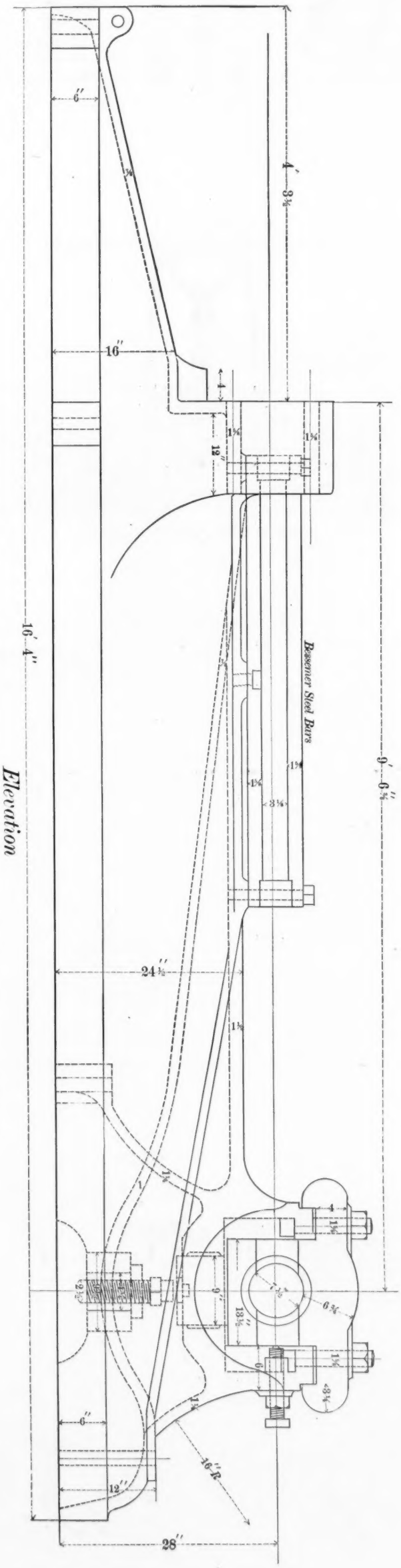
BECKETT & MCDOWELL'S HOISTING ENGINE FOR MINES.

New Hoisting Engines for Mines.

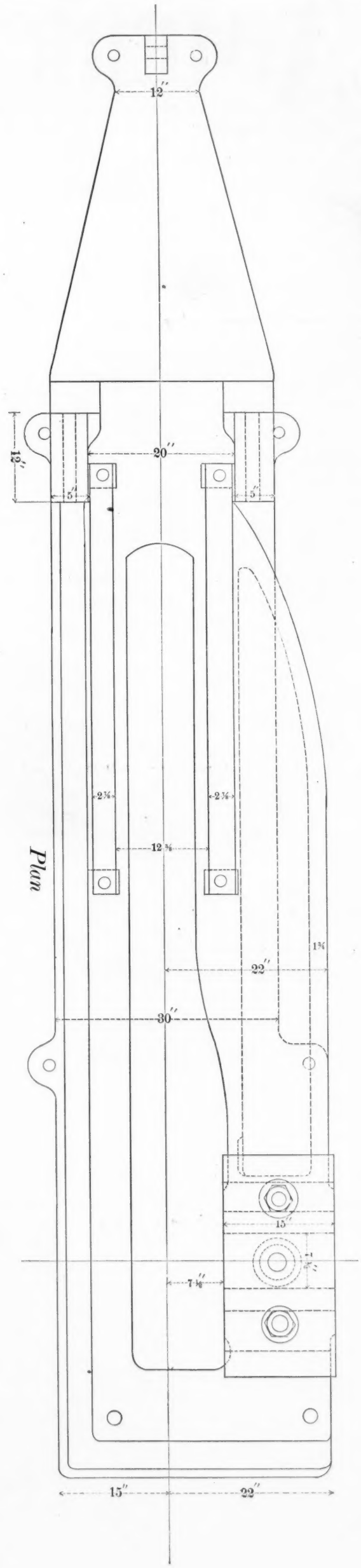
The illustration herewith represents a new design of hoisting engine for mining purposes, which has just been completed for the mining regions of Mexico, by the firm of Beckett & McDowell, 17 Courtlandt St., New York. The construction of this engine is such that it occupies the least possible floor space, without interfering in the least with its power or durability. The frames or bed-plates are of a circular form, and are made in sections, likewise all the other large parts of the machine, as shown. When taken apart no piece weighs over 375 lbs., which is a very important consideration, as the greater portion of mining machinery has to be trans-



End View



Elevation



Plan

100 H. P. Steam Engine, by W. H. Hoffman—Plan and Elevation of Bed Plate—Scale 1½″=1 Foot.

ported upon the backs of mules. This machine is no "child's toy," but when put together, as shown in the illustration, weighs 12,087 pounds. The cylinders are 8″×12″, and are strongly bolted to the end of the bed-plate. The piston-rods are made of steel, and are screwed into the cross-heads, and are firmly secured by jam nuts. The cross-heads are made of very tough cast-iron, being light and strong. The brass gibs, when worn, may be lined up by means of plain liners of tin or sheet-iron, they being less liable to give trouble than a wedge or key. The gibs are secured to the cross-heads by tap bolts.

The connecting rods are made of the best iron, with solid ends, thus making the rods stronger, besides avoiding the trouble and derangements attending the use of gibs and keys. The rod brasses are adjusted by means of an iron wedge, which covers the whole bearing surface between the brasses and the rods.

Both the crank-pins and the cross-head pins are made of steel. The links are made of wrought-iron, and case hardened. The eccentric rods and straps, which are provided with an oil box, are of the locomotive pattern. A plain slide-valve is used, which receives its motion from the valve-stem, which extends through the back end of the steam-chest, and is supported and guided by a horn attached to the steam-chest.

There are no threads or nuts upon the valve-stems, therefore the troubles and vexations experienced by the nuts getting loose are entirely avoided. Clamps are used in the place of nuts, which are simply square blocks of iron which are bored to fit the stem, slots are then cut through on one side and set screws applied, which will, when tightened, hold the blocks firmly upon the stems.

The wearing surfaces on these blocks are much larger than when nuts are used, and they may be more easily removed. Extra bolts are used to secure the steam-chest covers, consequently they are less liable to leak. The bearings of the pinions upon the shaft are of extra length, being 12½," and are furnished with brass bushings extending their whole length. The clutches have three projections, instead of two, as are generally used, which greatly adds to their durability. The engine shaft, which is 4″ in diameter, is composed of two pieces, has three bearings, and is furnished with a fly wheel, which forms a part of the coupling. The caps on the pillow blocks of the engines are placed at an angle of 45 degrees, so as to facilitate taking up the lost motion when necessary. Each of the drums is furnished with an independent shaft, 4½″ in diameter, to which the drums are securely held by keys, thus avoiding shocks to the engine. These drums are 4 feet in diameter, 2 feet long, and are composed of plates at each end, which are provided with recesses to admit the ends of the heavy oak lagging, which forms the surface of the drum upon which the rope winds. The large gear is made in two sections, likewise the plates referred to, for reasons stated.

Each drum is provided with an independent "ribbon brake," and also a clutch.

These, together with the throttle valve and reversing levers, can be manipulated by the engineer without moving from his position. All the arms and levers are fastened to the shafts by keys and set screws. The bearings are all large, and are babbitted in such a way that the metal extends the whole length of the journal, and there is no cast-iron allowed to come in contact with the shaft to cut it. The drums may be operated together or independent of each other, but when used together, as they usually are, the wire rope should be made to wind over one drum, and under the other, thus better counterbalancing the weight of the cages.

This engine was designed to raise a weight of 3000 pounds, from a depth of 1000 feet at the rate of 650 feet per minute. It will work from a greater depth, and raise lighter weights, but where the depth exceeds 1000 feet, practically it is better to use a direct-acting engine, for economy, safety, and rapid operation.

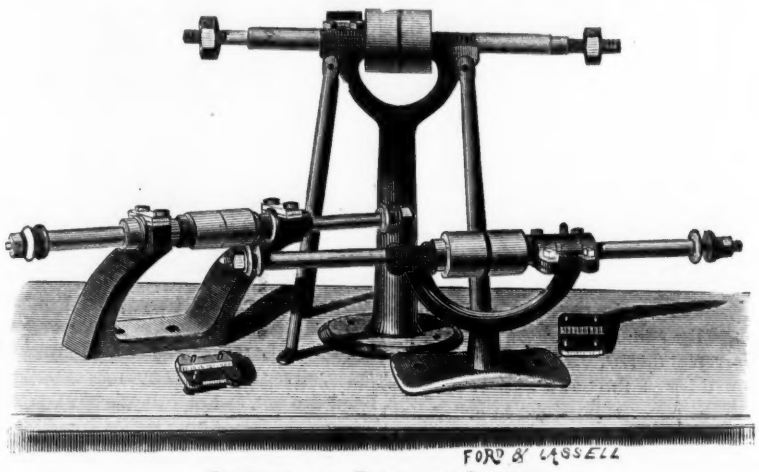
As an example of the despatch with which the manufacturers of this engine fill orders, we would state that this engine was designed, the drawings made, also the patterns, and the whole machine finished, ready to ship, in just twenty days after receiving the contract. With the present facilities the builders claim that this engine may be duplicated in twelve days, after receiving an order. We believe that these results are largely owing to the fact, that they have realized the great advantages to be gained by having a set of standard gauges, varying in size from $\frac{1}{8}$ inch up to 6 inches, and thus, any part of a machine may be duplicated. The parts of this engine are not highly finished. This would be simply a waste of valuable time, on mining machinery particularly, but the parts are all well proportioned. The works of Beckett & McDowell are at Arlington, N. J.

Working Drawings of 100 H. P. Engine—Bed Plate.

We present herewith the continuation of the series of working drawings of a 100 H. P. engine, by Wm. H. Hoffman, which was begun in our issue of January 3d. The part here shown is the bed plate. The designer claims this to be the best form ever produced for high steam and rapid revolution, while it weighs no more than a banjo or girder frame should weigh to do the same work. The main journal lower box has a vertical adjustment to correct errors, caused by settling of foundations, &c. The slide bars are of Bessemer steel, and are adjusted for wear, by simply facing off the distance blocks at each end between top and bottom bars. The back side of bed is straight on top side, but the front side is in a *truss* form, being lower at the crank end than at the slides. Thickness of bed is from $\frac{3}{4}$″ to 1″ in the body, and from $1\frac{1}{4}$ to $1\frac{3}{4}$″ in the flanges.

Improved Water-Wheel Governor.

The engraving shown herewith represents a governor for regulating the speed of water-wheels, as made by the Holyoke Machine Co., of Holyoke, Mass. The large wheel shown in the engraving at the top of the machine, is used for the purpose of opening and closing the gate, which admits water to the water-wheel. This is effected by means of a screw upon the rod which is attached to the gate. A bevel gear is attached to this rod, by means of which motion is transmitted from the governor to the rod. The general construction of the apparatus may be readily understood from the engraving. Motion is usually communicated to the governor by a belt $2\frac{1}{2}$″ wide, placed upon the pulley, which is 12″ in diameter, and runs at a speed of 145 revolutions per minute. The pulley may be run either way without affecting the effective working of the governor. A small crank is attached to the end of the shaft referred to, which connects with one end of a pitman, while the other end is attached to pawls or catches, two in number. These catches are held at a convenient position from the face of the spur gear, by means of a connecting link which allows the free oscillation of the catches. A tripping device is provided, which is controlled by the action of the governor. When the speed is uniform, the catches are held above the teeth of the gear, and remain inactive, but as soon as the speed rises above or falls below, the catches are brought into action, and communicate motion to the spur wheel, which, in turn, transmits motion to the bevel gears, thereby opening or closing the gate, thus regulating the speed. The speed may be changed permanently by means of a weight, shown in the cut. This governor is simple in construction, effective in operation, and may be applied to any water-wheel. The different parts are made to

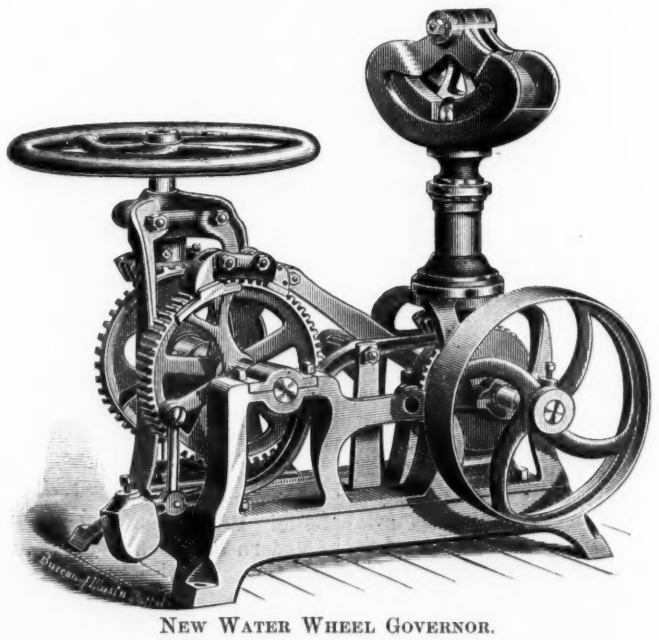


BUFFING AND POLISHING LATHES.

gauges and templates, so that they may be easily and quickly replaced.

New Buffing Lathe and Emery Wheel Stand.

The process of plating with silver and nickel is very extensively used, but comparatively little attention has been given to designing machinery to assist the process. We present herewith an engraving, showing on the right two sizes of an improved lathe for buffing and polishing, and on the left a stand for mounting small emery wheels. The essential features of both are the same. The machine has ring journals (cut with grooves or threads), causing the lubricating oil to stay in place until it wears out. The machine can therefore be run at high speed without heating. The journals do not permit any lateral motion, therefore the machine will run steadily and almost without noise. The journal boxes are fastened by four screws, by means of which they can be adjusted to a nicety. The grooved journals distribute the friction so there is less liability to heat. These machines are in use by a number of silver platers and give good satisfaction. The manufacturer is John W. Alexander, 92 Pearl St., Brooklyn, N.Y.



NEW WATER WHEEL GOVERNOR.

The Pullman Palace Car Company are to move their works from Detroit, Mich., and several towns are anxious to receive them, among others Aurora, Ill., and Racine, Wis.

Standard Freight Cars.

The master carbuilders of the New York Central, Michigan Central, Canada Southern, Lake Shore and Harlem Railroad Companies were in session at the Grand Central Depot, recently, to agree upon a standard freight-car to be used on all the Vanderbilt roads. After discussing many plans they decided upon a uniform style of car, both box and for cattle, which, it is expected, will be found so perfect that it will be generally adopted by the various roads throughout the country. It was also arranged to have the cars built by the shops of the respective lines represented, and the work will be begun at once.

Extracts from Chordal's Letters.

Mr. Editor:

* * * * Did you ever have a lightning machinist to work for you — one of those quick-blooded fellows, all energy and activity? When you walk out into the shop you see him going into the things for all that's out. When he strikes with a hammer, he strikes quick. When he starts for a thing, he starts with a flash, as though he had been shot out of a gun. When he lifts a thing, he simply jerks it up. When he lets it down, he drops it. When he goes to another part of the shop, he goes on a run. When he goes to the grindstone, he rushes there and rushes back. It is worth the price of admission to a trapeze performance to watch him at a lathe. He wants to change his belt and he snaps at it like a flash. He knocks his shifter instead of shoving it. When he puts a three-foot shaft in his lathe, he grabs it from the floor, snaps a dog on it, fixes one end on the live center, and lunges out after the tail wheel like a zouave on fancy drill. This genius not only does this when you happen to walk into the shop, but he does it all the time. All day long he jumps, and hops, and snatches, and strains, and blows, and sweats, and works hard and energetically generally, and when night comes he hasn't got any work done. That is the case, Mr. Editor; for this fellow is the biggest kind of a humbug. This energy of his is not execution. When you come to look into the chap you generally find he hasn't got sense enough to do anything, even if he took time for it. He is a born fool, or he wouldn't jump around so. He rushes a diamond point tool into the tool post, and screws down on it with a spin. Then he finds it wrong and unscrews it, and does it all over, and so on half a dozen times. He gets everything he does right by a succession of nervous twitches. He is chock full of vim and has no lazy bones in his body. He generally wins the approval of short-sighted bosses. He is known to be an honest, hard-working man, but he's a fraud of the grossest order, and isn't worth shop room.

* * * * Did you ever watch a barber who took nervous, short strokes with the razor? Every second his razor flies like lightning from your face to the paper on your shoulder. He reaches for brushes and things with vehement energy. My, but isn't he a quick barber! You watch him in the glass as he shaves you, but he don't seem to get any beard off your face, and don't seem to get much lather on the paper. The lazy chap "running" the next chair has taken slow, broad swipes, with a clean precision, from the faces of three customers since you submitted yourself to your quick man.

* * * * If you want to be shaved in time for a train, Mr. Editor, don't get under an energetic barber; and if you want to get a lathe job done in a hurry, don't go near one of these quick moving machinists. And if you should take your lathe job to such a one, don't tell him to rush it. If you do, you are gone sure. He can't rush anything. If you crowd him, he will set his tools that much more ineffectively; he will recklessly grind his tools, so they won't cut at all; he will recklessly belt to speeds so fast as to prohibit any iron being removed; and then will get back to the proper speed. If he wants to put a file finish on his horrible job, he can't find time to change to a high speed, so he goes hammering the job with a mill file, while the surface of the work moves at eighteen feet a minute. Every machinist of any sense soon finds out that filing lathe work at a slow speed is not the way to hurry a thing, but this energetic dolt never took time to find out anything. Better put him out in the yard and let him practice ground and lofty tumbling in breaking scrap iron. His useless gymnastics have no place in a machine shop. Put such a fellow on piece-work prices, which make a lazy man rich, and he will starve to death. There is something winning about the fellow's motions but there is no good in them.

* * * * If you want something done in a hurry, your lazy man is the one to do it. It isn't often he hurries, but when he does do it he enjoys it. A hurry once in two or three months is his recreation. Hurry this man for half a day, and he will be prepared to recommence his old lazy way with renewed vigor. This lazy fellow is susceptible of being hurried. You can't demoralize him by rushing him, because he won't hurry that much. He will slouch over to a grind stone, and fix a diamond point tool as he seldom fixes one. He will patiently grind the face down nicely, and give the edge a keener angle than he usually takes the time to grind to, and he is careful to grind the back of the cutting edge a little the lowest. When he gets back to the lathe after a while, he engineers that tool into its most effective position, and then he screws down on it. He starts up at a speed he knows won't glaze that elegant tool, and he shoves it into a cut as deep as the job will stand. Soon he will be piling great chips under his lathe, and your job is under the best possible headway. This elegant machinist will be sitting down on his tool board. He's tired, poor man!

* * * * I don't want to defend the lazy machinist, but when you want something in a special rush you will find that he won't do any reckless fussing. He won't make any false strokes for fear it will make too much work. He remembers every little thing in the past, which, by some miscarriage, caused trouble, and now he takes the sure and certain and effective path. If you are in a hurry for the job, he is particularly anxious that you shall have it as soon as possible. He is

a man who don't like to have hurried jobs on his hands any longer than possible. The other kind suits him best, and he will get back to them as quickly as he can.

Another good thing about this lazy chap is, that he never soldiers. He don't need to.

* * * * There is a certain kind of machinists who seem always to feel guilty of something underhand. When the boss comes around, they will antic about, and you would think they would work their skins off. This imposition succeeds only with that class of foremen who take considerable stock in the energetic fellow we first talked of.

Every smart foreman knows very well that during this effervescence the men are not doing anything at all. They are making unusual, idle, quick motions for a few minutes, just as our energetic chap does all day long. If they kept on they would get nothing done, and it is only when they quit this momentary making-believe, and go to work, that they commence to accomplish anything. When you see a man reaching out lively when a boss comes around, you can make up your mind that that chap has been soldiering. Such a man is generally a low down cur who has no honor that you can depend on. You must watch him. There are two kinds of machinists that I hate above all men. One is represented by the man who works furiously in another man's service, and has nothing at home to show for it, except the sweat wrung from his dirty shirts by his slouchy family, and the other kind is represented by the man whose general actions would lead one to suppose he had some honor, but who, whenever there is a tip-top chance, will be found comfortably fixed in some out-of-the-way place, knocking his heels together, and finding true delight in the hard task of trying to enjoy himself, while he is battling with conscience and keeping a good lookout for the boss. This is the soldier on duty. There are three ways to get along with him. First, kick him out of the shop for keeps; second, watch him all the time; thirdly, if your work will permit it, have a distinct understanding with him that he is to work for you five days a week for pay, and soldier one day at his own expense. I have tried this latter plan, and if the man don't drink, it works first-rate. One week-day idle in a busy man's life will make him feel glad to get into the shop for five days of occupation. In about a year you can give the man six days work a week, with perfect satisfaction all around.

* * * * If it was not for the two classes of workmen I have mentioned there would be but few misunderstandings between the two parties mutually interested in manufacturing, namely, the men who do the work and the men who hunt up the work and furnish the facilities for doing it.

* * * * Very respectfully,

CHORDAL.

Practical Draughting.—Management and Care of Instruments.

BY T. P. PEMBERTON.

When using drawing instruments be careful in learning how to handle them properly. The proper way is the easiest one. Beginners, and especially those who are accustomed to use iron compasses and steel dividers in workshops, are very apt to employ both hands in opening and closing the dividers and bows. This looks very awkward and is so. The T square belongs to the left side of the drawing-board, and is operated by the left hand. The right hand should be kept free for the purpose of picking up pencil, pen and bows; adjusting and marking off. The left hand controls the T square, and the triangle that slides along the upper edge of the square; the right hand is for the instruments. The joints of the instruments must be neither too loose nor too tight. They should open and close on a moderate pressure from the thumb and fingers. Practice will regulate this. A small, delicate hand can work with slacker joints than a heavy one used to hammer and file.

Be particular in having the legs of the dividers exactly the same length, and sharp, so that in pricking off distances and dimensions and centers, the indent or hole made in the paper is as small as possible. One of the beauties of a fine drawing is that the compass point marks can scarcely be discerned. Hence the touch must be light, and the prick point made by the dividers and needle points should be no more than can be just seen. Again, if the compass-point holes are large, the ink will flow into them when inking in and the appearance of the lines marred. To avoid making a great many compass-point holes, the student should accustom himself to the use of a flat scale. Paper scales are the best. By these he is enabled to dot off dimensions with his fine pointed pencil. This method of dotting off from the division lines on the edge of a scale has become a very general practice, and is a good one, as time is saved, accuracy insured, and holes in the paper avoided.

When using the bows, see to it that the steel-pointed leg that is put down first on the paper, to secure a center for a curve or a circle, is a trifle longer than the pencil or pen leg. If this is not the case the pencil or pen may touch the paper first and then a provoking slip will follow. Another thing should be remembered, viz., always have the steel-pointed leg of the bows as near perpendicular to the paper as possible, in order that the point may not work out a large conical hole, which it will do if the center is much used, and the leg stands at an angle to it. Here are a number of memoranda in brief:

Avoid fingering your drawing sheet as much as possible. In pointing to any part of the drawing, use a pencil and *not your finger* as a pointer. If foremen and master-mechanics would remember this, they would save some annoyance to draughtsmen, as sweaty and greasy and dirty fingers leave indelible marks. Avoid rubbing out and constantly cleaning with India rubber as much as possible. Much rubbing destroys the surface of the paper. If you make wrong lines or wish to make alterations, the part to be altered should be rubbed out entirely and completely. Do not trust to memory to make the change when you ink in; your attention then is pretty well absorbed in making nice lines.

Some draughtsmen put a round, sharp point on their pencils in preference to a flat one. A round point is better for dotting off from the divisions on scales, but a flat point that can be kept close to the edge of the square or straight edge will not require sharpening so often as a round one. In all cases the cedar should be well cut away. A small, smooth flat file should be used to sharpen lead pencils. The pencil should be rubbed on the file, not the file on the pencil.

In rubbing out a pencil line, rub out in the direction the line is drawn. Before putting away instruments, clean the ink well out and wipe them over with a piece of chamois leather. The perspiration from the fingers tends to discolor and rust them.

The telephone exchange movement is extending rapidly in England. All the principal cities and towns of Europe are organizing exchanges; that at Manchester already numbers 120 subscribers.

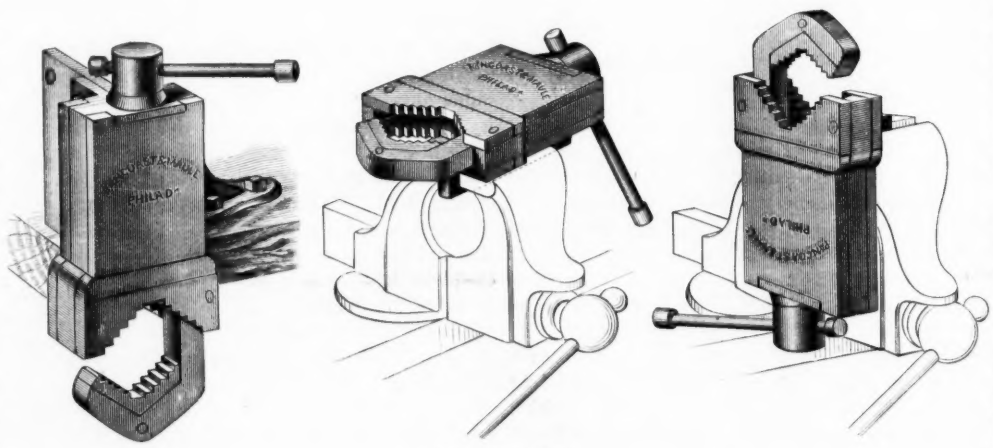
A Convenient Portable Forge.

The portable forge shown herewith is designed for use either with a blower or with a pair of ordinary bellows. It is adapted to using hard coal, and requires no water to protect any part against heating. By a very convenient device all ashes and cinders can be precipitated into the open space beneath the fire. It is one form of Patterson's forges, which have been in use for a number of years, giving good results. The tuyere is very

PATTERSON'S PORTABLE FORGE.

durable. Larger sizes are made for smelting brass, silver and gold, by means of a brick-lined fire pot. For full particulars, address Forge Co., Brooklyn, E.D, New York.

The operatives at Clinton, Mass., mills are losing $1,200 a day by their strike.



NEW PIPE VISE.

New Pipe Vise.

The accompanying engraving represents a novel and convenient form of pipe vise, manufactured by Pancoast and Maule, of Philadelphia. It consists of a simple form of pipe vise which is furnished with steel jaws, and may be readily understood from the illustrations. The principal characteristics of this tool are that it is so constructed that it may be attached to an iron bracket, which is bolted to a bench or post, and may also be readily, and instantly detached, and placed in a common vise, as shown, in different positions. These and other convenient advantages will suggest themselves, and will doubtless be appreciated by that class of mechanics who are accustomed to use a pipe vise.

Boiler Proportion and Construction.—Modern Smoke-Burning Furnaces and Improved Gas-Burning Settings.

BY WM. H. HOFFMAN.

In comparing pea coal with other grades in a previous article, I stated that I did not consider this coal economical, even at its usual low prices.

The comparison was made according to the general method of burning pea coal, viz., with a blower for forcing the air through it to support combustion. Within a few years, however, many experiments have been made with a view of dispensing with blowers in connection with fine grade fuels, such as the use of screenings, slack, or clum (coal dust), mixed in a machine designed for that purpose, with 10 or 12 per cent. of coal tar pitch. This material was then taken in paste form and placed in a powerful press, which converted the mixture into blocks or bricks of 2″×3″×5″. These were then stored for a short time, and were then ready for use. In burning this fuel, air was admitted to the top, as well as the under side of grate bars, and the results were found to be very satisfactory. The Delaware and Hudson Canal Co. were using this fuel quite extensively some years ago, and it is presumed they are still using it. This fuel had but one fault (which showed itself where small tubes were used), viz., the partial closing of the tubes by a resinous deposit from the pitch, in case the supply of oxygen was insufficient. This trouble was easily overcome by sweeping the tubes two or three times during the week, where the tubes were from 1½″ to 2½″ diameter; but 3″ and 4″ tubes required cleaning but once in two weeks. The idea of heating the air before its introduction to the furnace is of early origin, but the old methods have been greatly excelled.

Mr. B. T. Babbitt, the soap manufacturer, a man well read in all subjects pertaining to steam engineering, has devised and used for several years a heating apparatus in which all of the exhausts from engines, pumps, kettles, etc., are carried to a room or cell, in which is a large heater constructed of pipes, through which the exhaust steam from all sources is passed. The atmospheric air is admitted to the room through several openings that can be regulated, as to size, at will; this air, of course, is heated by the heater, and is then discharged directly under the grate bars, the ash pit being closed. The economy is carried still further by the designer in his arrangement of feeding the boilers, as all of the condensed steam, in the form of water precipitated by the heater, is returned to the boilers at a temperature of a little over 200°. Special pumps, built from Mr. Babbitt's suggestions, are used for this purpose.

The burning of wet fuel, such as *clear* slack, or clum, or peat, had never been successfully accomplished until the Jarvis system was introduced. By this patent device, the air is brought to the furnace above the grate bars by air tubes and cells in the sides and bottom of the setting. It is delivered through perforated fire bricks at a very high temperature, which it attains by its transit of the heated air tubes.

In this way the consumption of the gases that too often escape in the ordinary furnace are ignited, the heat evolved from them being very intense, and the evaporation consequently rapid, if the boiler is properly designed and constructed.

Various kinds of fine fuel are mixed with both soft and anthracite coal, the preponderance being in favor of fine fuel. By these mixtures, the Jarvis furnace shows the best results, but in all cases the chimney must be well proportioned, and the temperature of the hot air at its entrance to flue leading to chimney must be from 520° to 540°.

It now looks as if the history of smoke and gas burning furnaces will be about the same as that of the compound steam engine. Like the engine, the furnaces received considerable attention nearly one hundred years ago, and like the engine, they are now being perfected. At this writing, there is a large field for the inventive engineer. Let him cease inventing complicated and dangerous boilers that cannot be cleaned, and turn his attention to the furnaces, the grate bars and the combustion chambers of the boiler setting. The average evaporation of the fire tube boilers, as we now find them, is *less* than 8½ lbs. of water per pound of coal, but it should be not less than 10½ lbs. of water to 1 lb. of coal. Improvements in the design of the boiler have already gained half of the amount desired, and the boiler setting must furnish us the other portion.

Twenty moulders at the Schenectady (N.Y.) locomotive works have secured an advance from $1.60 to $2 a day by striking.

Gov. Proctor has voluntarily advanced the wages of the employees of the Sutherland Falls (Vt.) marble company 10 per cent.

How Pig Iron is Made.

BY WM. J. WILLIAMS.

Iron, viewing it from the standpoint of its usefulness is the most valuable of all metals; so important is it to the prosperity of man, that some of the best minds of the leading nations of the earth may be said to vie with each other to lessen the cost of its production, and improve its quality. Although known, and used to some extent, from the earliest times, it has been reserved for modern nations to set a true value to it; fortunately there is no California for iron, it being pretty generally distributed throughout the world. Some countries possess it in larger quantities than others, and when coal is to be had at a convenient distance, that country having possession of both, together with the skill required to use them, is in a position to compete with any other part of the world similarly situated. The use of iron might be said to have revolutionized the world, and its future influence is probably not less than its past.

Pure iron, in nature, does not exist. Wherever found it is in combination with some proportion of oxygen and impurities, and is known as "iron ore." Pig iron is composed of iron and carbon, principally, the quantity of carbon contained in different qualities ranging from 1½ to 5 per cent. Sulphur, silicon, phosphorus and copper are also found in combination, but their influence on iron so produced is beyond the intended scope of this article. The conversion of iron ore into pig iron requires a large outlay of money for steam engines and boilers, and a huge furnace, varying in height from 50 to 100 feet, has to be built. Ore mines must be opened—limestone quarries must be worked, and last, but not least, coal must be mined and transported, from quite a distance, perhaps.

The form of the interior of a furnace is the frustra of two cones, joined at the base, terminating in cylinders at both ends. The material of which it is built is fire brick. The *hearth* or bottom is sometimes of fire brick, put up in form something like the letter S, but curved, so as to fit closely against each other, and grouted with fire clay.

There are two courses or layers in depth; or the hearth may be of some refractory grit rock. Its outward form is sometimes that of a broad, truncated, four-sided pyramid of stone or brick, having an arch in each side. One is called the *working* arch, where the iron and cinder are drawn off at certain intervals of time. The others are called the *tuyere* arches. Or it may be that of a cylinder, partly supported by strong iron columns, the structure being either surrounded by a sheet iron casing, perforated with a number of holes about three inches in diameter, to allow the escape of any gases that may find their way through the structure. In some cases strong bands of wrought iron surround the furnace. Whatever may be the form of the outside, the interior is practically the same in all cases, and they are built separate and apart from each other. Between the two, there is a space to allow the interior to expand without cracking the outside; it also allows the interior to be entirely removed or repaired without detriment to the outside. This space is sometimes filled with dry sand or broken cinder; the whole structure is called the *stack*.

That part of the inside of a furnace, where the frustra of the two cones meet, is called the *boshes;* the word is derived from the German word *böschung*, a slope, and is supposed to be the part of the furnace where the reduction of the ores begins, this form having been adopted because the inverted frustrum of the lower cone prevents the stock from crowding down to the hearth on account of its sloping form. The upper frustrum prevents any obstruction of the stock finding its way to the *boshes*.

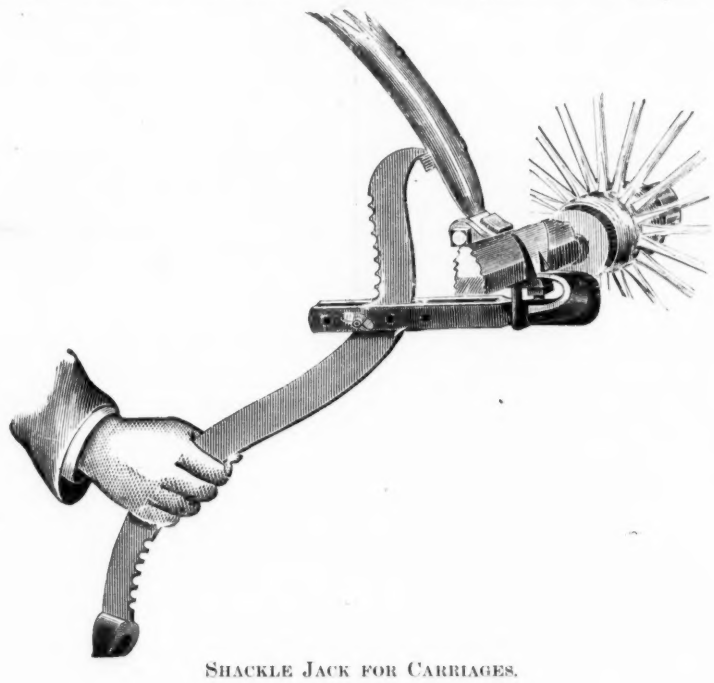
In the working arch, a large granite stone (*called the dam stone*) is placed at the base of the furnace, in contact with the hearth, its upper side being slightly above, its width is somewhat greater than the thickness of the furnace at this part; the bottom of the tap hole for iron is the upper side of the dam stone. The reason why a stone is used in the construction of a furnace in this part is, that were it made of fire bricks, they would soon be destroyed by the action of the iron bar used to open the tap hole; there would soon be such a breach that it would be impossible to stop it up. The tap hole enters the furnace in a slightly slanting direction, the inner end being the lowest, causing the melting iron to flow through the hole in an upward direction, and into a sort of gutter called the *trough* on its way to the pig beds prepared for it.

The tap hole is luted with fire clay, as soon as the iron is drawn off, and sometimes becomes so baked with the heat as to make it exceedingly difficult to open. Sometimes it cannot be opened in time to prevent injury to *tuyeres* from the contact of the molten iron within. In order to guard against this, there is another tap hole above called the *rabbet hole*.

Above, and to one side of the tap hole, is the *cinder notch*, a hole for letting off the cinder when it has reached a height in the furnace beyond which it is not desirable it should go. This hole is luted with ordinary clay or loam, with about an equal proportion of coal dirt. The cinder flows down over a sort of incline called the *fall*, one side of which is formed by a long and thick cast iron plate, set on its edge, near the tap hole for iron, its bottom edge on a level with it, the upper edge forming the height of *fall*. This plate is called the *dust plate*.

Through this means, the cinder is made, while in a melting state, to run outside of the building. Above the rabbet hole and

FOR WOOD DASH. FOR LEATHER DASH.



SHACKLE JACK FOR CARRIAGES.

cinder notch is the *tymp*, which is a place provided to insert a tuyere, in case the stock in that part of the furnace has a tendency to chill.

When it does so tend, a tuyere is inserted in the tymp, and a portion of the blast is made to enter it, and cause the temperature of this part to be raised. The tuyere used is generally smaller than the others, and is known as the *monkey tuyere*. Water is constantly circulating through the tymp for its preservation. Before proceeding farther, it may be well to explain to the uninitiated what a *tuyere* is, and what it is like. It is the end of the blast pipe that is inserted in the sides of a furnace.

To make a tuyere, a sufficient amount of gas pipe (usually one inch), is coiled like a hollow truncated cone, the ends of pipe extending beyond the base 2½ or 3 feet. This is called a *tuyere coil*. Take this coil to a foundry, and have the coiled part surrounded by cast iron, so that it shall have the form of a hollow truncated cone, with two pieces of gas pipe extending beyond its base, and we have a tuyere. When in use, water enters by one branch, and leaves by the other continually; without the circulation of water through it, five minutes would be sufficient time to destroy it.

In the tuyere as many arches are inserted as are thought necessary, all having water circulating through them, and these are packed around with fire clay to prevent the contents of furnace at this point from being blown out by the blast entering through them. The tuyeres enter the furnace where the lower cylindrical part joins the lower truncated cone. This is also called the *crucible*.

At the top of the furnace, and within, is set an inverted, hollow, truncated cone, called the *hopper*, and underneath this is a cone suspended at its apex by a *crane*, forming a movable bottom for the hopper. This is called the *bell*, and upon it the *stock* is emptied. After it contains the desired amount, the bell is lowered and the contents fall down into the furnace; it is then raised to receive a fresh supply.

This arrangement of the bell and hopper prevents much of the gas generated in the furnace from escaping into the air, as in the old open-top furnaces, as it is needed for heating the air, or *blast*, as it is called, before entering the furnace. A portion of this gas is also needed for raising steam to run the blast engine and other steam power, such as hoisting engine and steam pumps. The platform surrounding the top of a furnace is called the *tunnel head*. From near the top, two flues, made of thick sheet iron and lined with fire bricks, are led down outside the furnace, one going to the *hot oven*, the other to the steam boilers for generating steam.

A hot oven is a building divided into two or more compartments, and wholly composed of fire bricks, having *registers* set in the walls for admitting air, when needed, to the gas contained within to cause it to ignite.

If the engine is a vertical one, the *blowing tub* should be found above the steam cylinder, to prevent any leakage from piston rod stuffing box falling on the blowing tub and being forced into the furnace with the blast. A blowing tub is a large cylinder supplied with a piston, which is provided with either wooden or leather packing rings. To prevent leakage of air from one side of piston to the other, in the heads of the blowing tub are apertures, supplied with gratings, to which leather valves are attached, opening inwards, and called *receiving* valves. Attached to each head is a chamber containing also leather valves; these are called the *delivery* valves.

Uniting these chambers is a branch pipe which conveys the blast to a *receiver*, usually a large cylinder of sheet iron, from 40 to 50 feet long, and from 5 to 10 feet in diameter; it is supplied with a weighted lever and valve for the purpose of preventing a possible bursting of it. From thence it enters a pipe on the outside of hot oven; this pipe has as many branches (supplied with stop valves) as there are compartments in the hot oven, each of which contains a series of large cast iron pipe through which the blast is heated while passing through them, on the opposite side of the hot oven from which the blast entered. They are joined by another branch pipe (supplied with valves), and from it the blast is carried to the furnace and part way around it.

The pipe here contains as many branches or *necks* as there are tuyeres to enter the furnace. Attached to each branch is a chamber containing a weighted valve hinged at the top and opening inward. The pressure of the blast keeps these closed, and they are never allowed to open except when stopping up the cinder notch, after drawing off the cinder, or during a stoppage of the engine previously agreed upon. Allowing them to drop as it is termed without notice would be apt to fill the belly pipes with cinder, and cause a loss of time.

Attached to these chambers are stout wrought iron pipes in sections, the one slipping into the other. The opposite ends of these pipes are inserted into the tuyeres. These are called the *belly pipes*, and in the ends under the valve chambers is a hole about one inch in diameter, for the purpose of inserting a rod of iron of sufficient length to reach the innermost end of tuyere, to free it of any cinder that may become attached to the inside. This hole is closed with an iron plug, when not in use. The object of dividing the blast in the hot oven is that one series of pipe can be repaired or renewed without interfering with the working of the furnace; the products of combustion are carried off by a chimney, as is also that from under the steam boilers.

[*To be Continued.*]

Two Useful Inventions in Driving.

When the thrifty young machinist or draughtsman of the period drives out on one of these breezy Spring evenings with his sweetheart, next to careful driving, the proper management of the young lady's wraps becomes an important matter. While a good horse may seldom require the use of a whip, it is manifest that a buggy without a whip is like a locomotive without a cow-catcher, or a kite without a tail—a thing utterly without style and not to be thought of for a moment. It is equally manifest that handling the lines, holding the whip, and holding on the wraps aforesaid are operations that cannot successfully be performed at one and the same time by even the most enterprising young man. It is true, the young lady might be allowed to hold the whip, but this expedient would, in many cases, be too suggestive of a desire upon her part later on, to hold and use the whip through life, than would be prudent in an intending husband to encourage.

In view of these considerations, the patent Whip Holder illustrated herewith, and made by Pratt & Letchworth, Buffalo, N. Y., deserves notice, its simplicity, durability and convenience all combining to recommend it. It is adjusted to the dash, the cuts showing manner of attaching to either leather or wood dash. The socket being in one piece, not jointed, cannot work loose, and is always noiseless; it cannot retain water, holds the

whip firm and straight, prevents abrasion, and does not cover up the elegant workmanship of the whip handle. The convenience of inserting the whip when driving is a matter of considerable importance, the sides serving as a guard to guide the whip into the socket. These desirable features have all been fully tested in practice.

Another equally useful, but less romantic invention is Stone's patent Shaft and Pole Shackle Jack, made by the same firm for use upon carriages.

The application of this invention is shown in the cut, from which it will be seen that when in use the hook catches upon the clip yoke or bar behind the axle, the arms or prongs of the hook striking beneath the axle; when in this position the lever grapples the shaft either on the shoulder of the shaft eye, on the shaft iron itself, or upon the surest grappling point, the nut of the first bolt securing the wood to the shaft iron, as shown in the cut. This furnishes a leverage which easily compresses the rubber so as to allow the shaft bolt to be put in and avoids the danger of stripping off the thread.

The notched end is intended for use with poles, though it may be used on shafts when there is a shoulder on the shaft eye.

It will be observed that the leverage can be changed by a proper use of the bolt holes in the hook and the notches on the lever, so that this jack can be used with any style or shape of shaft, it being the most readily adjusted of any Shackle Jack in use. It is simple, durable, and effective.

Letters from Practical Men.

TROUBLESOME FRICTION CLUTCHES.

Editor American Machinist:

If there is ever a convention of lathe builders, please let me know, as I would like to *interview* some of them who make and sell such abominable friction clutches with their lathes. We have three different kinds in our shop, none of which are good for anything; in fact, I had rather have the old fashioned noisy clutch. If I could express myself in writing, I should attempt (through your columns) to stir up lathe-makers in general, and, perhaps, they would be induced to improve. I don't mean to condemn them all, as I have no doubt there are first-class clutches made, though I never saw any that suited me. The fault with some is, when you start your lathe, the shipper "won't stay *put*" without propping it with a stick, or tying it with a string or wire, and then ten chances to one it will get caught in the back gears and cause delay, if it does not break out some of the teeth. With others the fault is just the reverse. If you have them adjusted so there is any stopping point, they are so loose that an ordinary cut will cause them to slip, and if adjusted tight enough to pull any load at all, there is no stopping point, but the lathe cone will rotate backward and forward like the balance-wheel of a watch. The one in our shop afflicted with the last named disease has been the cause of many mashed fingers by getting them in the back gears. I do wish somebody would get up some kind of clutch that would work. It would save some harsh sounding words at least.

Baltimore, Md. Frank S. Brown.

ABOUT PISTON VALVES.

Editor American Machinist:

Will you kindly allow Schneider to answer the questions asked in reference to Piston Valves, by "Machinist," of Boston, Mass., in your column of Questions and Answers, issue of February 21st, 1880? The answers there given may lead to a misapprehension of facts.

1st.—How tight do they fit the valve to the cylinder of a piston valve?

Ans.—When a piston valve is fitted to the valve case (and all piston valves should have a case inside the steam chest as nearly entirely surrounded with steam as possible) either as a simple plug, or with expanding rings, it is the usual practice to fit it so that it can be moved easily by the hand when cold, without shaking transversely, and care need not be taken to warm the valve and casing uniformly, provided they are constructed properly, because the valve case will be expended before the valve is heated, and all possibility of "jamming" be avoided. Jones allowed his piston-valve engine to stand utterly neglected and uncared for for two or three years; one day he tried to turn it over and couldn't; valves rusted in the case so tight that a "persuader" had no effect whatever. Schneider is sent for post-haste—engine ain't worth a "continental." Schneider appears, looks around at the various extemporaneous appliances piled up at hand, whispers something that sounds like cuss words, and orders the steam-chest covers put on, rod connected, turns open the throttle, and the engine jogs on as if it had never been stopped, while Jones mixes up Scripture language and higher mathematics indiscriminately, as a small compensation for the vexation and expense he has been enjoying. It was queer—he intended it to be understood that he did not know enough to open the throttle.

Smith is a very exact man. Smith runs a piston-valve engine; a wise man from a neighboring town calling to see Smith one day, and, looking at the engine says, piston valves are no good as they leak, besides being a great bother, trouble and expense. Smith has had no trouble or expense so far, but he must be sure that all 's right. He sends next day for the wise man who knows all about piston valves; the wise man comes, sets out the rings, and *drives the valve in with a sledge*, good fit, excellent—don't leak or stick, and ran for years after without repairs—so much for tight fits. When the valve case is perfectly round, and the valve is also round, the valve can be quite loose, and not leak steam.

2d.—How do they grind the inside of the cylinder?

Ans.—The case is bored and reamed, or ground, according to the facilities at hand in the shop where they are made. Some parties who make a specialty of this form of valve have a machine for grinding out the case, and grinding the valve, and they are as true as good machinery can make them; others have a series of reamers differing from each other very slightly in size, which they run through the case after it is bored, and which make the hole very true and smooth; and still others, who only build an engine now and then, grind the cases with a lead lap and emery, or with the valve itself, when an expanding valve is used, and a good job can be done so, too, with proper care.

3d.—Is it a first-class valve when worked in a vertical position without packing rings?

Ans.—"Experience says so." The great majority of vertical piston-valve engines are made with solid valves, because they are cheaper to make than expanding or ring valves, and answer every purpose. A solid valve, well fitted, is good enough for anybody, and will run long enough without leaking to pay for fitting a new one when worn out. They do wear some, and especially when the valve-rod is without a guide, and receives the side thrust and pull of the eccentric. In practice, *in some cases*, it has been found that there is a tendency to wear the bridge between the steam and exhaust ports, but this can be overcome by proper construction, and there must be a very considerable leak indeed to neutralize all the advantages attending the use of a piston valve. Packing rings, properly made, will help this trouble, because the valves can be ground in place and the leak stopped in a very short time, and Schneider thinks they should always be used upon horizontal engines because the weight of the valve has a tendency to cause a downward wear, although extending the valve-rod through both steam-chest heads prevents this wear in a great measure.

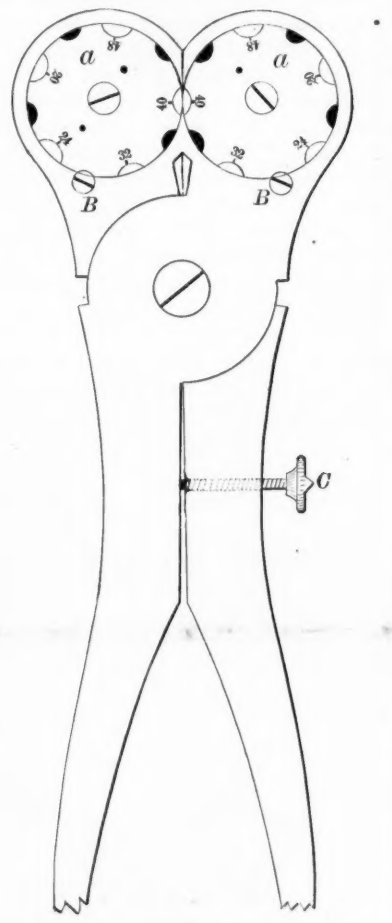
Schneider has no business to proffer any advice to "Machinist," but as it won't be heeded, he will venture to say, that he would not advise anybody to go into the piston-valve business unless they have time, patience, and plenty of money to spare for experiments; or unless somebody is available for posting purposes, who has already been through the mill, and had experience enough with them to know how to make them properly. There are enough piston valve engines now in the market which must, of necessity, be a source of waste and trouble to the buyers or users because of improper construction. If "Machinist" desires to see how piston valves should be fitted, let him examine and handle one of Wm. Sellers & Co.'s steam hammers.

Jersey City, N. J. Schneider.

A HANDY SCREW CUTTING TOOL.

Editor American Machinist:

As I feel I have received much benefit through the "Letters from Practical Men," as published in the American Machinist, I think it no more than fair to contribute something to aid in the mutual advancement of our craft. I give, herewith, a little cut of the tool. It consists of a simple pair of tongs, as in pincers, the jaws of which are enlarged sufficiently to admit of being



counterbored to receive the circular dies, as at *A*. They are held in place by stop screws let into the edge, as at *B*, and may be turned to bring the cutting portions in the position for use, after the stop screws have been backed out two or three times, by the use of a pin wrench in the holes, shown in the face of the dies. There is also a stop screw for gauging the size of screws, shown at *C*. I find this tool very handy in model work; in cutting small screws in the lathe, it is in every way superior to a solid die, as you can let go after cutting the required length, thus saving backing out, and there is no danger of getting a drunken thread.

Chas. S. Beach.

Eagle Bridge, N. Y.

VALUE OF TEXT BOOKS AND FORMULÆ.

Editor American Machinist:

In your publication of March 6th, I noticed an article written by Egbert P. Watson, in which he wishes to be placed on record as caviling at hand-book practice in every-day work. As this article is capable of doing much damage among the skilled workmen just entering upon the field of design, I beg leave to recall their attention to a few of his statements. He implies, in the beginning, that the prevailing impression of the existence of useful hand-books and rules in the drawing room is a fraud and a delusion. He asserts that he has found a text-book advising the use of 240,000 lbs. per square inch of section for the strength of crucible steel. Where he found this we are at a loss to know, for of the number of text books at our command, not one recommends a safety load of over 20,000 lbs. per square inch, although Wood, in his Treatise on the Resistance of Materials, does state that "The most remarkable specimen of cast steel for tenacity which is on record, was made in Pittsburgh, Pa. It was tested in the Navy Yard at Washington, D. C., and was found to sustain 242,000 lbs. to the square inch." How this could be interpreted by the careful reader as advising the use of 242,000 lbs. per square inch for the strength of cast steel in calculations, is beyond our comprehension. Again, he states upon his own authority, in criticising the use of a one-inch piston rod for a four-inch head, that "A rod one inch in diameter, so far as strength goes, would be ample for a tensile strain of forty tons, more or less." We are inclined to think that his "Rule of Thumb" would have, in this case, at least, slightly irritated his "dyspeptic boss;" but we are, however, willing to state that as the experiments of Barlow, Whitworth, Fairbairn, and many others do not recommend a safety load of more than five or six net tons per square inch, some carefully made and accurately recorded experiments by Mr. Watson, warranting the above load of fifty tons per square inch, would be of inestimable value to the engineering profession. He closes his article, recommending the abolishment of text books, rules, formulæ, etc., as follows: "Materials vary so much in strength, according to their mixture, or the locality from which they come, that no general rules can be laid down, so far as mere strength of material goes."

This is in part correct, as our text books have frequently informed us; and in order to guard against any error from this cause, they have given a large number of experiments, carefully drawn their deductions therefrom, and in case of doubt have advised the use of that coefficient of strength which would give the greatest factor of safety. To show the need of hand-books, rules, etc., in the designing room, let us take for an illustration one of the most simple cases imaginable, namely, a ten-ton hydraulic crane such as we find in every day use in our Bessemer steel works for handling the heavy ladles of molten steel. After the young engineer has made himself thoroughly acquainted with the necessary data, how is he going to wrestle with this simple problem? Must he not be able to calculate the sectional area of the vertical shaft, in order that the available water pressure per square inch will raise the given weight with the desired velocity, or in order that it may withstand with perfect safety the maximum strain to be brought upon it? Must he not be able to calculate the most economical section of the boom under the given conditions? And must he not be able to find in his hand-books, as the results of other men's experiments, the strength of a certain shaped rolled iron which he wishes to use? In this manner might we continue to ask an unlimited number of questions, indisputably proving the need of carefully kept records, in the shape of hand-books or text-books, of past success in the designing room. It must be admitted that a general and indefinite knowledge of the existence of certain principles and rules used in engineering design is a dangerous thing upon which to build a steam engine; but an intimate acquaintance with their distinguishing features and methods of application is as necessary to the good engineer as was the thorough knowledge of the English language to Daniel Webster.

Dwight E. Pierce,

P. O. Box 595. Bethlehem, Pa.

ANSWERS TO SCREW CUTTING PROBLEM.

Editor American Machinist:

I noticed a problem in screw cutting on page 7, of No. II, Vol. 3.

Required: Compound gearing to cut a thread $1\frac{1}{8}$ inch pitch; the feed screw of lathe has five threads to the inch. If I might offer a solution to the same, I would give the solution in this way:

Divide $1\frac{1}{8}$, the number to cut, by 5, the pitch of feed screw, and multiply the quotient by 72, the number of teeth in gear on spindle, and this product by 60, the number

of teeth in driving gear on stud. Divide this product by 36, the number of teeth in receiving gear on stud, which gives a quotient 27, the number of teeth in gear on feed screw of the lathe:

Thus $\frac{1\frac{1}{8}}{5}$, or $\frac{1.125}{5} = .225$

$\frac{.225 \times 72 \times 60}{36} = 27$, number of teeth on gear of feed screw.

It is necessary to know the number of teeth in the gears belonging to the lathe in order to choose those most convenient. I simply offer this as the solution to the problem. Many lathe hands may have forgotten how to do it, as most indexes on lathes do not give fractions of threads.

FRANCIS MCCRANN.

Providence, R. I.

Editor American Machinist:

I can see nothing very difficult in the problem propounded by C. A. Hague in issue of March 13, 1880.

I would reason it out and say, that if one revolution of the screw to be cut would advance the nut $1\frac{1}{8}$ inches it would require 8 revolutions to advance the nut 9 inches, and on the lead screw it would require 45 revolutions to advance the nut same distance, or 9 inches; therefore the ratio is as 8 to 45.

Now, to compound the gears, I would make the ratio of stud gear to lead gear as 45 to 16, giving to the two gears on intermediate stud a ratio of 2 to 1. To enumerate gears in the order they would come on stud, place 90, or any multiple of 45, on receiving gear of intermediate—say, 30 on driving gear of intermediate, 60 or twice the size of receiving gear on same stud, and on lead screw 32 or any multiple of 16 that is taken of 45 for the stud gear. F. H. MORSE.

1,176 Tremont St., Boston.
March 6th, 1880.

Editor American Machinist:

In your issue of March 13, I find the following problem:

"Required:—Compound gearing to cut a screw of $1\frac{1}{8}$ pitch; the feed screw of lathe has 5 threads to the inch."

Solution:—Eight revolutions of screw of $1\frac{1}{8}$ pitch will require lathe-carriage to move 9 inches, or 45 revolutions of feed screw, which will require the following gears:

Drivers, 100 and 90.
Leaders, 40 and 40.
Proof $8 \times 100 \times 90 = 72{,}000$.
$45 \times 40 \times 40 = 72{,}000$.

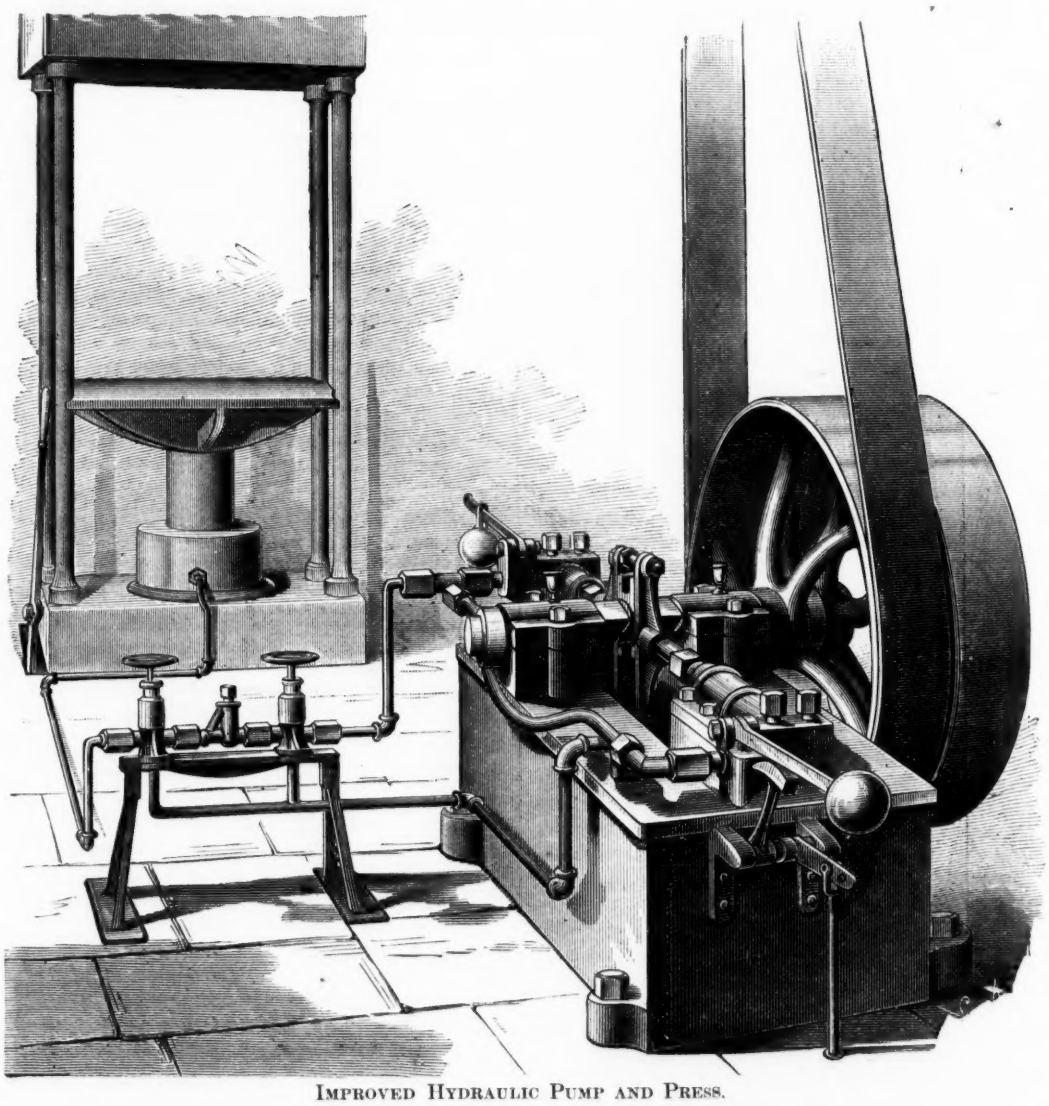
THOMAS V. STILLMAN.

Westerly, R. I., March 8, 1880.

Improved Hydraulic Pump and Press.

The press shown in the accompanying engraving is the ordinary hydraulic press, and can be used with any pump. The chief element of novelty in the cut is the pump, and the manner of its operation, in connection with the press shown, in doing any kind of work where great pressure is required. A leading feature in the pump is its system of double pistons, one large and one small, amounting, practically, to two distinct pumps. The larger pump supplies power for the earlier stages of pressure, enabling the press to rise faster. At the proper time, by means of the side lever, shown in the background of the cut, the larger pump is disconnected, and the smaller pump is attached, causing a slower rate of speed, adapted to extreme pressures. The advantage of such a system of hydraulic pressure, over that embodied in a uniform motion press, is obvious.

By a simple change in the arrangement of the valves, the pump may be operated in any convenient position, however remote from the press. The valves are of large area, and may be readily removed or refitted. By a suitable arrangement, several presses may be run at one time by a single double-plunger pump. The makers are Messrs. E. Lyon & Co., 470 Grand St., New York.



IMPROVED HYDRAULIC PUMP AND PRESS.

American vs. British Locomotives.

We continue from last week extracts from the letter of Mr. Brereton, Engineer in Chief of the Great India Peninsular Railway to the Agent General, London, on the superior working results of American Locomotives as compared with English railway experience:

In order to arrive at a fair comparison with the cost of repairs in England, there are a number of points which should be equated, such as cost of labor and materials, effects of climate, steeper gradients, sharper curves, and heavier loads hauled, as in all these the American engines labor under greater disadvantages than engines in this country or in India. The Americans economize far more than we do in the first cost, and in repairs and renewal, by adopting a system of interchangeability of parts as much as possible, and by limiting the number of types or classes of engines. * * * *

As regards train-mileage, the following comparative statement, showing working results on English, American, and Indian railroads for the year 1876–77, will prove interesting and instructive:

English.	No. of Engines.	Miles operated.	Train-miles per engine.
Great Western	1,478	2,274	17,397
Great Eastern	505	907	20,600
Midland	1,326	1,588	18,219
London & North-Western	2,058	2,158	15,800
	5,367	6,927	4)72,016
Average of all			18,004
American.			
Pennsylvania	515	*1,071	32,627
New York Central	602	†1,000	30,870
Michigan Central	219	804	30,812
Erie	468	956	26,900
	1,804	3,831	4)121,209
Average of all			30,302

* On the Pennsylvania Railroad, including the double and third lines, the aggregate number of miles operated by the 515 engines was 2,881.

† On the New York Central the same was 2,433 by 602 engines.

Indian.			
East Indian	450	1,504	14,737
Great Indian Peninsular	331	1,288	17,000
Madras	100	858	23,334
Bombay and Baroda	64	417	19,149
	945	4,067	4)74,220
Average of all			18,555

The above shows 12,298 more train miles per engine for American roads than for English, and 11,747 than for Indian roads. The following statement shows the average cost of locomotives on four of the English roads, and the average cost of American engines:

English.

Midland	£2,648
Great Eastern	2,271
Great Western	1,767
London and N.-Western	1,617
4)8,303	
Per Engine	£2,076

American.

1st-class Passenger Engine (C)	£1,720
1st-class Goods Engine (D)	1,800
1st-class Goods Engine, extra power (E)	2,300
3)5,820	
Per Engine	£1,940

* * * *

I find, from the official reports of the colony of Victoria, that the American locomotives built for the Government Railways by the Rogers Locomotive Works, of Paterson, New Jersey, cost, erected in Melbourne, £2,132 each; whereas those built in England, and erected in Melbourne, cost from £2,352 to £3,032 each, and those built in the colony itself cost erected from £2,939 to £3,571 each. * * * * They were built and shipped under his direction entirely. The best American narrow-gauge engines cost, delivered f. o. b. in New York, as follows:—

1st-Class Passenger (C) ..... £1,500 per engine.
1st-Class Goods (D) ..... 1,600 per engine.
1st-Class Extra Goods (E) 1,700 per engine.

Mr. A. Morris, Executive Commissioner (to the Colony of New South Wales) to the Philadelphia International Exhibition of 1876, reported to his Government that American engines of the very best quality could be laid down in Sidney for £2,000, or £1,000 less than for those contracted for in England. * * * * * * *

Now, if the best American engines can be laid down in India and in our colonies as cheap or cheaper than English engines, and if they will run easier and with greater steadiness, involve less expense in repairs and renewals, and do less damage to the permanent way, it is surely worth while for consulting engineers, directors, and agents to consider the economy their introduction must occasion.

At the same time I must say it would be better if they were never ordered than to place them at the disposal of any prejudiced or narrow-minded superintendent who would be sure to injure them and give them a bad name, as was done in South America. In the hands of an intelligent and liberal-minded superintendent, I am confident they will prove far more effective and economical than our Indian and colonial experience has hitherto found to be possible with English engines.

* * * * * * * * *

It should be remembered, on the principle that "the proof of the pudding is in the eating," that the Americans are the most experienced railway managers in the world, as they have upwards of 74,000 miles in daily operation, 3,000 miles of which are narrow gauge lines. * * * * * *

I believe if we adopted the use of the cast-iron chilled wheel we should effect an immense saving. These wheels have a life of 100,000 miles, and cost only £3.10s. as against £7 to £9, the cost of the English steel-tired wheel. The weight of a wheel for a passenger carriage is about 525 lbs. The metal is charcoal iron, having a tensile strength averaging 14 tons per square inch. When you compare the life and first cost of these wheels with those you have in use in this country, in India, and in the colonies, I think you must be struck with the financial importance of the result.

Labor, Wages and Strikes.

Fall River operatives have had their wages advanced 10 per cent. throughout the city, but are still dissatisfied and threaten a strike.

The Smith Paper Company of Lee, Mass., will advance wages 10 per cent. April 1st.

The Troy (N. Y.) painters have agreed to charge 50 cents a day more for all grades of work after April 1.

The Collins Company of Collinsville, Ct., manufacturers of plows and edge tools, have increased wages all around, from five per cent. in some cases to seven and ten per cent. in others, according to the nature of the work and merits of the several workmen.

The mule spinners of the Falls Manufacturing Company's mills at Norwich, Ct., have mulishly struck for an advance of 10 per cent.

Buy your Saratoga trunk before the price goes up. About 80 journeymen trunk makers of Boston, who have been earning $10 a week, have struck for $20, refusing an offer of $15.

The employes of brush works at Lansingburg, N. Y., bristled up and made a demand for higher wages which was complied with.

The Springfield, Mass., bricklayers are getting higher. They are to have $2.75 a day and more as soon as they can get it.

Even the hod carriers are rising. They recently formed a union at Lowell, Mass., and declared for $1.50 a day after April 1st, and $1.75 after June 1st.

The wages of the workmen at Stimpson's piano-leg manufactory at Westfield, Mass., have been advanced 10 per cent.

The Edgar Thompson Steel Works, Pittsburgh, Pa., have advanced the wages of their laborers from $1.30 to $1.50 per day.

The workmen in the sheet mill of Hussey, Howe & Co., Pittsburgh, Pa., recently combined for an advance of twenty per cent. The demand was granted, and will go into effect in a few days.

In the car-shops in Philadelphia, Wilmington, Harrisburg, and vicinity, there are at present upward of about 5000 men at work, receiving an average advance in wages of about 20 per cent. as compared with 1878.

The puddlers of the Penn rolling mill, at Lancaster, Pa., have received an increase of 50 cents a ton for puddling.

The moulders in the Walter A. Wood mowing-machine works at Hoosick Falls, N. Y., have resumed work at the old wages, on the company's promise to advance the pay of those whose pay is small.

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☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers inventors, draughtsmen and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers who fail to receive their paper promptly will please notify us at once*

☞ Entered at the Post Office at New York, N. Y., as second class mail matter.

NEW YORK, MARCH 27, 1880.

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The Mechanical Engineers' Organization.

The growing interest everywhere manifested in the new American Society of Mechanical Engineers, is a gratifying sign of mechanical progress. The formation of the Society takes place under the most favorable circumstances. Of the three grades, members, associates and juniors, the former will include those properly entitled to write M.E. after their names. Juniors will in time become eligible as members. Among associates will be included many prominent manufacturers and others whose business is directly dependent upon mechanical engineering, yet who have not given their attention to acquiring a knowledge of the details involved in its practice. It is worthy of note, however, that members and associates are to have equal privileges in the Society. The standard of qualifications for admission will, and should be high.

The meeting for organization, April 7, will be held at the Stevens Institute, Hoboken, N. J., by kind permission of President Morton. A code of rules will then be adopted, officers elected, and a membership enrolled. At the preliminary meeting held at the office of the AMERICAN MACHINIST, February 16, it was voted that the chairman be requested to appoint thereafter a committee on organization, to whom the rules read at that time were recommended unanimously for adoption. The committee has been constituted as follows: A. L. Holley, Chairman; Prof. John E. Sweet, H. R. Worthington, Prof. W. P. Trowbridge of Columbia College, Eckley B. Coxe, the retiring President of the American Institute of Mining Engineers, Gen. Quincy A. Gilmore, of the U. S. Army, Jackson Bailey, Editor AMERICAN MACHINIST.

This committee will report at the meeting on April 7th, when the work of organization will be completed.

It is worthy of note that although the annual meetings of the Society are to be held in the city of New York, the other two meetings each year will be held elsewhere, thus making it, in fact, a national organization.

Vagaries of Mechanics.

In nearly every shop there is a workman who does the blowing and grumbling for the whole establishment. We have now in mind one of this class of men, a chronic grumbler, who goes about the shop growling about the proprietor and the foreman because he can never find a tool when he wants it. He goes from one man to another inquiring if any one has seen that particular tool, and when answered in the negative gives vent to his indignation in a volley of the vilest oaths. After he has succeeded in finding the tool he has been searching for he sits down and examines the same, finds fault with this, that and the other part, for half an hour, then gets to work. After he has done using the tool, instead of putting it carefully away in its place (if there is one), he lays it carelessly upon the bench or floor where it is soon covered up, and he himself becomes the cause of the same disorder which he so strongly condemned a short time before.

A strike takes place in a certain shop in an adjoining town. Grumbler goes for all the items concerning the same, and returns to the shop with the astounding announcement that the strike is but in its infancy and will spread all over the country, and will sweep everything before it. He leads off with: "Now, boys, the sooner you go in for it the better. We'll make the 'old man' (or company, as the case may be) come to time. We'll show them whether we have any rights or not." Grumbler sometimes carries his point and gets the men to contribute money to support the strikers in other shops.

During the railroad strike of 1877 several of the grumblers after having solicited and received a very fair collection, soon after appeared in new suits of clothes and failed to render any report as to how the money was disposed of.

Afer a strike many of the men when applying to the proprietor for a job are told that their services are no longer required. They severely condemn the grumbler who has taken particular pains to smooth matters over with the "old man," and has succeeded in keeping his situation.

In answer to the question: What books and papers do you read in reference to your business? the grumbler will exclaim: "Me! What do you take me for? I never read books which pertain to my business; books are all very well for theoretical men, but of no earthly use to practical men. I want plenty of practice, but confound your books and mechanical papers!" We may attempt to convince Grumbler that in order to produce the most valuable results, or to make the best mechanic, it is necessary to bring theory and practice together. In vain do we set forth the advantages to be gained by following this course, and try to convince him that most of the authors and publishers are working to accomplish this end.

As a man advances in life, his likes and dislikes become more apparent. The grumbler's friends are disgusted, and leave him, one by one. He finally loses his job, and is left to his reflections. We will dismiss this subject with a few words to the young mechanic. When you find a man answering to the above description, shun his society, for he is after your pocket-book. Whatever may be your business, acquire all the information pertaining to it that comes within your reach, in both papers and books. Treat your shop associates in a kind and respectful way, and some day you will find a shop owner wanting just such a man as you are to take a position as foreman or superintendent. Never listen to grumblers, and, above all things, avoid being influenced by what they say.

Newspaper Organs.

The Mechanical Engineers have formed an association as will be seen from the report elsewhere in this paper. We presume that the AMERICAN MACHINIST will be their organ, as it well deserves to be, for no better mechanical paper the world over is published. Its contents are always solid but never stupid, and any machinist or student of mechanics will always, to use a much abused expression, find it "interesting and instructive."

We clip the above very complimentary notice from the last number of our contemporary, the *American Miller*. While acknowledging the compliment so generously expressed, we must at the same time disclaim any intention of being an "organ" of the American Society of Mechanical Engineers, or of any other institution. In the first place the AMERICAN MACHINIST is abundantly able to stand alone without the special patronage of any association whatever, and in the second place the new Society, in our opinion, will be capable of much greater usefulness if it is not tied up to any specified newspaper, institution of learning, or outside mechanical or scientific association. It should, however, if properly conducted, receive the cordial and united support both of the press and the technical institutions, as it neither conflicts with one nor the other.

High and Low Engine Speed.

In our last issue Mr. Chas. T. Porter's able article on the "Advantages of High Speed Engines," concluded with a remark that may either be construed as a challenge or a prophecy, as the reader may elect. Speaking of the size of the fly-wheel relative to the number of revolutions, Mr. Porter says (the italics being our own):

We have assumed the fly-wheels, in the cases compared, to be of the same diameter. But it is found desirable, in practice, to reduce the diameters, and that very much. Now we discover that large diameter has been the vitally important feature in the fly-wheels of what we now call slow speed engines. * * * *

If, then, we wish, in the case first supposed, to reduce the diameter of the fly-wheel to one-third, say, for example, from 24 feet to 8 feet, we must keep the same sectional area of rim But what a wonderful thing this is, to be able to substitute an 8 feet in place of a 24 feet wheel! * * * *

I have employed for these illustrations a speed of 50 revolutions in contrast with one of 150 revolutions, because this is just about the change that the next twenty-five years is to see generally made.

From the beginning of this able series of articles, as we announced in advance, we have held our columns open for the discussion of both sides of this important question, but thus far, we believe, no one has attempted to controvert a single statement or deduction made by Mr. Porter. Have the low speed men nothing to say?

Touching the changes that the next twenty-five years are to see accomplished in the steam engine, we are reminded of a remark made by one of our ablest American mechanical engineers to this effect: The only regret he felt at the probability that he should not live fifty years longer, was, that he should not live to see what the steam engine was to become within that time.

Good Machinists Wanted.

Good machine-shop men are in demand this week, as reference to our advertising columns will show, the special calls this time being from Fitchburg, Mass., and Newark, N. J. The firms asking for more help are first-class establishments, and promise good pay and steady employment.

We present this week a continuation of the working drawings of a 100 H.P. horizontal steam engine, by W. H. Hoffman, which were begun in our issue of Jan. 3. We should, perhaps, ask our readers' indulgence for the delay since the first of these drawings appeared, but will here offer, as a strong excuse, the fact that our columns have been crowded for the last few weeks with valuable matter that could not well be set aside to make room for the large space required for detail drawings. This subject, however, has attracted widespread interest, and we propose to continue the drawings as frequently as practicable, without interfering with the other departments of the paper.

The New Boy in a Machine Shop.

Our esteemed correspondent, "Chordal," not content with the almost invariably flattering compliments that are sent us on his behalf (only a few of which are forwarded to him by us, from fear of making him vain) has at last received a compliment—this time from a lady—to which his susceptible nature cannot be indifferent. From the animated tone of his letter in calling our attention to the circumstance, we much fear that a mechanical flirtation (upon his part) may be the result. He encloses a copy of *Lippincott's Magazine* for January, 1880, containing a marked article contributed to that periodical by Mary Dean, who confesses that she is owner or part-owner of a machine shop, is a reader of the AMERICAN MACHINIST and an admirer of "Chordal."

We have read the article in *Lippincott* with great pleasure. It is admirably written, and would almost reflect credit upon even "Chordal" himself. The style is vivacious, and portrays vividly the picturesque side of apprentice life in the machine shop. Speaking of a boy's transition from the farm to the machine shop, the writer says:

Beneath the hangers and whirling shafts and pulleys moving leather belts cross and recross intricately before the boy's eyes. Along crowded aisles of lathes, drills, planers, bolt-cutters, each with shining piles of work about it, glide workmen picturesque in blue overalls. There is a subdued purr of machinery—a whir of buzz-saws and stickers in the wood-shop, a click of hammers, and a ponderous thud of drop and trip-hammers in the blacksmith shop. In the blacksmith shop, which is a spot of grimy order and neatness, the boy sees an army of leather-aproned men working or standing in attitudes of massive ease. Working over the fires, they *hold their chins out*, with their heavy beards projecting to screen their faces.

* * * * * * *

Hat in hand, the boy seeks the foreman. That worthy, being "quite too very awfully American," says, "Put on your hat, man: this ain't Canada." The foreman is a keen-eyed man of a quick and quiet mind. He is never surprised and never discouraged: it is his business to overcome difficulties. He has a liking for the red-faced farm-boy, who, he knows, has already had a lifetime's experience

in work. At eight years this boy "wed the garden," at nine drove the cows, at ten milked, at eleven rode the reaper, at twelve ploughed, at thirteen mowed. And he can handle saws, chisels, screw-drivers, and hammers, and can mend everything on the farm. All doors open to him, while the city youth, who has idled away his childhood, finds them closed.

* * * * * * *

The boy begins a new life, working only ten hours a day. At first he does not know enough to stop when the "laying-off bell" rings, and the men are asking him if he "ain't sorry he's learnt the trade," and are sending him from one to another for "the half-round square," and "the left-handed monkey-wrench;" and he breaks things fearfully with his heavy hands before he learns the strength of iron, steel and brass. There are two sets of men in the shop—aristocrats and plebeians. The aristocrats are the best class, and the more we have of them the better, as Emerson says. The aristocrat journeymen dress well, are intelligent, decent and polite. The plebeians are all grades of ruffians, some of them virtuous in spots. The best jours. have patented something or other—the stuffing-box and packing of a locomotive or a nozzle for a variable exhaust-pipe—making their own models in polished brass like bits of jewelry. Every jour. hates the town where he was born and every place he has lived in since. The aristocratic apprentices have heads full of thoughts, study and dreams of the great objects of life. Of evenings they draw; some learn a little play out of the old dramatists; some study algebra, geometry or the calculus, that they may know how to lay out the teeth of gearing; some learn the secrets of steam. For them in the future thousands of wheels spin, hammers fall, planers glide. The plebeian apprentices spend their leisure in diablerie, principally in learning to drink at a low tavern half a mile away. They are the born serfs, villeins, churls to poverty and drunkenness.

* * * * * * *

Revisiting the farm, the boy sees afar his old oxen, knowing them by their mien, and the well in the sheep-pasture that he made and banked with sods that it might look natural and not scare the silly creatures. And they have a dough dinner at the farm-house, a pot-pie and apple dumpling—acme of dinners! But the boy does not regret the farm: he looks forward. *He is master of matter: he has a farm in the palm of his hand.*

The Glasgow Company, South Hadley Falls, Mass., were the last to cut down, and they are the first in that town to raise the wages of their help. They made an increase of about 10 per cent., taking effect March 1st. This restores the last reduction.

Business Specials.

40 cts. a line for each insertion under this head.

New Illustrated Catalogue of Lathes and Tools of all kinds for Machinists and others. Hopkins' Gear Cutting Attachment for Lathes, Improved Work Holder, Tyson Gas Engine, Small Motor for Scroll Saws, Dentists' and any light machinery. Address, Jackson & Tyler, Baltimore. Md.

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Lathe Attachments for Milling Plane and Irregular Forms; Taps and Reamers fluted and Gears cut without removing from the lathe centers. For extended description, see AMERICAN MACHINIST, Sept. 13 and 20 issues. Send for circular to Wm. Main, 65 Henry Street, Brooklyn, N. Y.

Car Builders' Dictionary. Now ready. Assigns names to kinds and parts of railroad cars, identifying each. 800 engravings, and 490 pages. Price, postage prepaid, $2. Ten copies to one address, $17.50. Published by the *Railroad Gazette*, 73 Broadway, New York.

Engines Indicated—Power Measured. W. H. Odell, Box 274, Yonkers, N. Y.

Norris & Rutter, Mechanical Draughtsmen and Patent Solicitors, 424 Walnut Street, Philadelphia.

Having sold my interest in the firm of Watts, Campbell & Co. Machine Works, Newark, N. J., I am desirous of connecting myself with some firm as Mechanical Engineer, or will act as agent for a first-class steam engine builder in New York City and vicinity. Address, Henry Parsons, No. 137 Belleville Avenue, Newark, New Jersey.

See Standard Turbine advertisement in last number.

First-class machinists and moulders wanted for miscellaneous work; good wages and steady employment. Address Watts, Campbell & Co., Newark, N.J.

School of Mechanical Engineering, including, besides the usual studies, practical instruction in the several trades employed. For particulars, address Richards & Dole, Springfield, Mass.

Send for price list of Patterson's Portable Forges Forge Company, Brooklyn, E D., N. Y.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) J. E. S. Springfield, Mass., writes: I have a hydraulic press of 300 tons capacity. Plunger, 6 in. diameter, with 5 feet rise. What troubles me is I cannot prevent the packing from cutting. It is made of leather of the usual style, 5-8 inch wide, where it comes in contact with the plunger. The recess for the packing is located 6 in. from the top of the bore, and is ¾ inch deep. The leather packing will cut or wear a small hole at the top, sometimes on one side and sometimes on the other. I do not think it is out of line for the reason stated: 1. What is the cause and cure? *A.*—The packing used in your press is very badly proportioned, and entirely too light for the pressure that you require. The recess for the packing should be ½ inch deep, in order to allow thicker leather to be used. Our impression is that in forming the packing, the grain of the leather is broken by necessarily bending it too short, as you cannot use a thickness of more than ⅛ of an inch. The bend should be nearly a true circle and of good thick leather. If you have no means of making the groove deeper, we would recommend that you make a packing of good thick leather ½ inch deep instead of ⅝, and scarf both edges well from the inside out. 2. Which side of the leather should be put next to the ram? *A.*—The grain or hair side, always. 3. What is the best lubricator for the ram? I find that if I use oil it will affect the working of the valves in the pump. I am now using plumbago, which does better than tallow or oil. *A.*—The packing before being put in place should be well oiled with pure neatsfoot oil, to which has been added a little lampblack, to give it a body, and prevent the water from penetrating it, after which no oil should be put upon the ram. Wipe it dry and apply a little pure graphite or plumbago occasionally.

(2) F. A. F., Eldred, Pa., asks: Will you please tell me which has the most bearing on the rail, a wheel six feet in diameter, or one four feet in diameter? As for example, the driving wheel of a locomotive. *A.*—The six feet wheel. For the reason that as the diameter of the wheel is increased, the nearer will the periphery of the wheel approximate to a straight line, which is represented by the rail. Another reason is that the surfaces of both the tire and rail are of an elastic nature, and enlarging the diameter of the wheel brings more of the two surfaces in contact.

(3) W. N. H., Philadelphia, Penn., asks: Can you infrom me how much heating surface I ought to allow for a coil boiler? I am designing a 4″×5″ cylinder engine, and am somewhat puzzled to know the proper amount of heating surface to allow for that size boiler. *A.*—We would say that, under ordinary circumstances, 10 square feet of heating surface per horse-power would be sufficient. The coil boiler is to a great extent still a subject of experiment and criticism.

(4) O. C., Sedalia, Mo., asks: Won't you give us a cut showing the best "piston balance valve" now in use, with an article in regard to its construction, economy, etc? I do not remember seeing much in reference to it in your paper, and I think that any information given concerning it will prove beneficial both to manufacturers and journeymen machinists. *A.*—We refer you to Schneider's letter in this issue, which contains some valuable suggestions, and we expect to show a cut and have more to say upon the subject in the near future.

(5) R. C. P., Worcester, Mass., writes: 1. Can you give me a recipe for holding bone, crockery, or glass very strong? *A.*—Copal varnish, 15 parts; drying oil, 5 parts; turpentine, 3 parts. Melt in a warm bath, and add 10 parts of slaked lime. 2. I would also like a cement for holding rubber rolls to an iron shaft? *A.*—An excellent cement for this purpose was published in our issue of Jan. 10, 1880. The hole in the roll must be thoroughly cleaned with benzine. The success of any cement or glue generally depends largely upon the manner in which it is applied. The parts should always be thoroughly clean before applying the cement.

(6) E. S., Brooklyn, N. Y., writes: Will you please inform me which is the most powerful of two engines, each having 12 inches bore of cylinder, but one having 18 ins. stroke and the other 22 ins. stroke, under equal pressures of steam, they being of the same H.P.? And will one do the same work as the other? *A.*—One of the most important points in this question is not mentioned, namely, the *speed of piston*. In questions of this kind, it is necessary to understand that power is pressure acting through space in a certain time. If two engines, having cylinders of the above-mentioned diameters, are working under the same steam pressure, and making the same number of revolutions per minute, the power developed in each would be as 18 is to 22, but if the engine having 18 ins. stroke was to make 122 revolutions per minute, while the 22 ins. stroke made 100 per minute, with the same pressure of steam and the same diameter of cylinder, the power developed would be the same, because the piston speed would be the same.

MANUFACTURES.

The Woonsocket, Rhode Island, Machine Company are to enlarge their works at Fairmount by an addition to their present building of forty feet in length.

P. & F. Corbin, New Britain, Conn., have set over a tubular boiler with the Jarvis furnace, and burn screenings for fuel.

The Reading Coal & Iron Co. have purchased the property of the Pennsylvania Iron Co., at Danville, Pa., operated by Waterman & Co. The purchase includes the furnaces, rolling mills, foundry, machine shops, and all the real estate. The price is understood to be about half a million dollars.

Miller, Metcalf & Parkin, of the Crescent Steel Works, Pittsburgh, Pa., are building a two-story brick addition to their wareroom. The extension is 64 feet long and 34 feet wide.

A new blast furnace is to be built at Kyle Slope, Jackson county, O.

From $1,500 to $3,000 worth of machinery—iron working tools—is to be in a short time added to the works of the Stockwell Screw and Machine Co., Cleveland, Ohio, necessitating an increase of about fifty per cent. in the number of hands employed.

In one week, recently, the Consolidated Safety Valve Co., Boston, received orders from Canada for 40 brass "Pop" valves, also three large orders from locomotive builders, and orders for stationary valves from Conn., Mich., Ill., Penn, and Maryland. They are two months behind orders, are putting in new tools, and taking more shop room.

The Ashcroft Mfg. Co., Boston, received orders in two days, recently, for over 1,000 steam gauges, half of them to be provided with brass cases. They are extremely busy.

The Telegraph Supply Co., manufacturers of the Brush Electric Light, Cleveland, O., write us: We are at this date at least two months behind orders, and do not seem to be able to catch up.

Among the Ohio companies recently incorporated are the Ohio Safe & Lock Co., Cincinnati, by D. Block and others; the Cincinnati Barbed Fencing Co., by B. H. Cox and others; the Griffin Road Machine Co., Elyria, by Chas. T. Elery and others; the Stacey Manufacturing Co., Cincinnati, by W. M. Stacey and others, and the Toledo Foundry & Machine Co., by John Best and others.

The foreman of a wood-working machinery establishment in this city says they are making a new saw table which is "going off like hot pretzels."

The Springfield (Mass.) *Republican* says: The George F. Blake Manufacturing Company of Boston, proprietors of the Knowles steam-pump works at Warren, have given $100 for a free reading room, and citizens have subscribed $200 for the same object.

A new corporation was formed at Bridgeport, Conn., Feb. 9, for the manufacture of silver plated spoons, forks, etc., with a paid up capital of $75,000. Theo. D. Rogers is president.

Large orders for car wheels from the United States have been received, and are now in course of execution at the McDougall iron foundry, Three Rivers, Canada.

It is proposed to build a cotton mill on the falls opposite the city of Milledgeville, Ga.

Fort Worth, Texas, is to have a large woolen mill.

Rhodes & Sons, Taunton, Mass., are preparing to build an addition to their shoe button manufacturing establishment.

A machine for making card clothing has been perfected by C. F. Kent, Worcester, Mass., which is said to have many advantages over any now in use.

The Thrift File Works, of Philadelphia, are building an addition to their works, 33×43 feet, two stories high. They will put in a new engine of 40 horse-power.

Hermann Aukham & Co. have laid the foundation for their new skirt factory, near Troy, N. Y. The structure is to be 100 by 60 feet, two stories high, and will give employment to 200 hands.

Lock Haven, Pa., is to have a furniture factory.

Messrs. Neafie & Levy (Phila.), have about 450 hands employed in general work, including an iron freight steamboat for New York parties, 90 feet long, 26 feet beam, 7½ feet deep, with engines 18 inches diameter and 20-inch stroke; an engine and boiler for the Eastern Steamboat Company, of Bath, Maine; an iron steamboat for the New York, New Haven & Hartford Railroad Co., 100 feet long, 21 feet beam, 10 feet hold, with engines of 26-inch diameter, 30-inch stroke, and a wooden steamer for New York parties, 75 feet long, 17 feet beam, 7½ feet deep, with engine of 20-inch diameter, 18 feet stroke.—*American Ship.*

The Kemp & Burpee M'f'g Co. has just been organized in Syracuse, N. Y., to manufacture the Kemp manure-spreading machine. Frank B. Clock is president, and Geo. B. Leonard, treasurer. Several of the machines are now owned in the city, and one was on exhibition at the last county fair. The location of the company's buildings has not yet been fixed upon.

The Westinghouse Air Brake Co., of Pittsburgh, has established a manufactory and warehouse in London, England. They are located in Canal road, near the King's Cross railroad station.

D. Saunders' Sons, Yonkers, N. Y., are just shipping 3 six-inch pipe-threading machines to Wm. Allison & Co., Phil. They are very busy in filling orders for pipe-threading machines.

Frick & Co., Waynesboro, Franklin County, Pa., write us they are running their Steam Engine and Boiler works ten hours daytime, and two hours at night. They employ nearly one hundred and fifty men. They have orders ahead for the season to the amount of $40,000. "Eclipse" farm and portable engines and sawmills.

The Camden (Pa.) Tool Works have resumed work after an idleness of twelve years.

The Chapman Valve Manufacturing Co., of Indian Orchard, Mass., have lately added to their extensive works an addition of 50×50 feet, and are about to manufacture a new fire hydrant with independent valves.

Fifteen large Otis boilers are being worked upon in the Cleveland, O., Steam Boiler works.

The Morse Twist Drill and Machine Company, is to build a large addition to its works at New Bedford, Mass.

Griffith & Wedge's machine works, of Zanesville, O., have procured a contract for about $90,000 worth of machinery for the Empire Silver Mining Company. The contract includes two 150 horse-power engines, one 60 horse-power engine, other heavy machinery, and a 60-stamp silver mill.

The Deane Steam Pump Company, of Holyoke, Mass., have bought out E. H. Baush's machine repair shop in order to add the room, about 50 feet long, to their establishment.

A large file works is talked of by a company of St. Louis capitalists, also a horse-shoe factory.

The Lenters Manufacturing Company, a new corporation in St. Louis, have embarked in the manufacture of wagon hubs.

The Marshall Car and Foundry Co. has been organized to build car works at Marshall, Texas. It is intended to build large shops, thoroughly equipped with the best tools. Mr. Charles Cobb, of New York, is president, and Mr. John Dickson, late of Louisville, general manager.

In the car shops in Middletown, Pa, which are soon to resume work, three hundred men will be employed.

Chase, Merritt & Blanchard are building a large brick factory at Salem, N. H., to take the place of the one destroyed by fire the 12th of January last. It will be used for the manufacture of Evans' imitation leather.

Machinists' and Engineers' Supplies.

NEW YORK, March 11, 1880.

The supply market remains bare of novelties, and the general tendency is to remain unchanged for the present.

Iron and Brass goods, also pipe fittings, remain unchanged. The demand continues greater than the supply.

The manufacturers of iron pipe have caught up with their orders, so that they are able to meet the demand very comfortably.

Machine Screws have as yet been advanced only slightly, and will undoubtedly go higher in time.

Iron Review.

NEW YORK, March 11, 1880.

There is no change in prices to report this week. Business good and prospects fair.

Pierson & Co., 24 Broadway, N. Y., under date of March 11th, 1880, quote prices out of store as follows:

No. 1, X Pig, $42½ per ton; Iron Rails, $68 to $70, according to weight; Old Rails $43 to $44; Fish Plates, 4c. per lb.; Railway Spikes, 4¾c.; Bolts and Nuts, 5½c.; Common Bar Iron, 3 7-10c., basis from store; Refined, 4c., basis; Ulster, 5¼c., basis; Machinery Steel, 7c.; Best Tool Steel, 13½c.; Norway Bar Iron, 6¼c.; Norway Shapes, 6¾c.; Nail Rods, 7c.; Sheet Iron, 5c., basis; Angle Iron, 4 3-10c.; Tee Iron, 4 8-10c; Band Iron, 4 7-10c.; Hoop Iron, 4 8-10c. and up according to size; Horse Shoe Iron, 4 7-10c.; Hot Polished Shafting in lengths, 2 ft and longer, 9 to 10½c., according to size; Small Black Rivets 30% off in papers, 10% off in bulk.

Boiler-makers supplies: Flange, 6¾c.; C. H. No. 1 Shell, 5¼c., C. No. 1, 4¾c.; Sheets, 4¼c. basis; Boiler Tubes, 5 and 5% discount.

Metal Review.

LUCIUS HART & CO., 8 & 10 Burling slip, New York, furnish us the following, under date of March 11, 1880:

During the past week Pig Tin has declined still more in price. The stocks—spot and afloats—are too large for an immediate advance. The light shipments for this month and the consumption of the article which goes on very satisfactorily will, however, soon rectify this condition. London and Singapore are also lower; the former, £90, the latter, $29½. We quote Banca, 24; Malacca & Straits, 21½c.; Billiton, Australian and English Refined, 21@2 ¼c.; "Lamb & Flag," 21c. Pig Lead, weak, at 6c. Antimony, Cookson, 24@25c.; other brands, 20@22c. Spelter, strong, 6¾c. for American or Foreign. Ingot Copper, higher in London, here inactive. Nickel, $1.25. No. 1 Solder, 12¾c.; "Half-and-half," Solder, 14½c.

WANTED.

Wanted—A thoroughly practical general machinist as under-foreman for a small machine shop; must be a steady, reliable man. Address, with experience and salary expected, Plon, care American Machinist, 96 Fulton Street, New York.

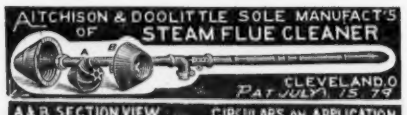
Situation wanted by a first-class Wood Pattern Maker; understands Gear Making; 16 years experience. Address, S. E. B., 104 Stratford Ave., Bridgeport, Conn.

Situation Wanted—By a Practical Steam Fitter of twenty years' experience—a situation as foreman. Thoroughly understands steam heating, high or low pressure, direct and indirect radiation. Would prefer the West. Can furnish first-class testimonials. Can make plans, specifications and estimates of steam heating. Address STEAM, care of Geo. Sargent, South Weymouth, Mass.

Wanted immediately, 20 good machinists; good wages and steady employment. Fitchburg Steam Engine Co., Fitchburg, Mass.

Wanted to correspond with parties in need of a first class mechanic and draughtsman, who can design and construct modern steam power, mill work and special tools. Could act as foreman in machine shop and set up work in case of emergency. Address J. S., care American Machinist, 96 Fulton St., New York.

ALTCHISON & DOOLITTLE SOLE MANUFACT'S OF STEAM FLUE CLEANER



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Flat Rough													24		
" Second Cut	10	20		2				10		2					
" Smooth	10							4		2		2	3		
" Dead Smooth													4	12	
Half-Round Rough											10		3	10	6
" Second Cut	15	15	10							2		2			
" Smooth		20								1		20			
" Dead Smooth	20	10	4	11	2					1	7				
Round Second Cut		8			2			3		1	18	6			
" Smooth	15	6	10	6	10		14	18	15	8	3		6	2	
Four Square Bastard	15				5										
" Second Cut	20			4	5		10	6	30	3		2		4	
" Smooth	20	6	18	4	16		5	4	20	8	10	6	10		
Three Square Bastard													5	10	
" Second Cut								3	4	1	1				
" Smooth															
Hand Bastard	10	4	4	6	50										2
" Second Cut	20	8	6	9	35			8							6
" Smooth	5		20	4	8			7		20	15	2			
" Dead Smooth	8		9		18				4		3		3	8	
Equaling Bastard									15		6		2		
" Second Cut							6		10		8		4		
" Smooth			2				18		14		16				
Knife Smooth			4						3						
Bastard Second Cut														40	
Taper Saw, Second Cut Single										5			3		
Three Square Parallel Bastard			21	25	10	15	10								
Warding Bastard							20								
Round Parallel Bastard									2		2		4	6	7
Square " "									2						1
Taper Saw Double Cut to point	36	18			8		10	7	2						

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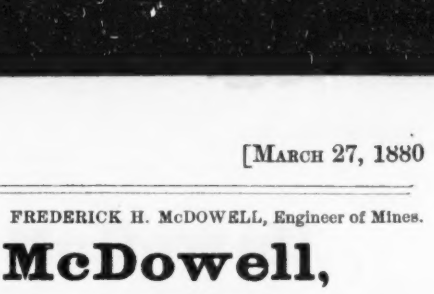

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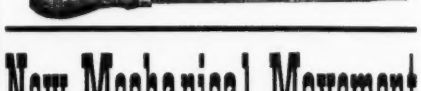

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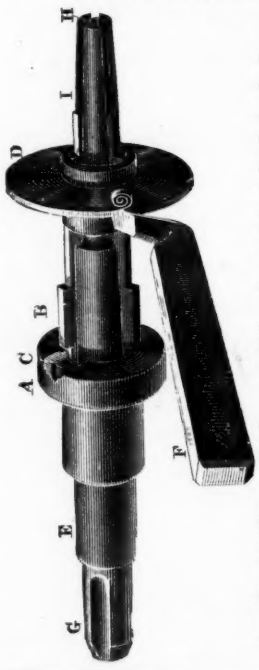

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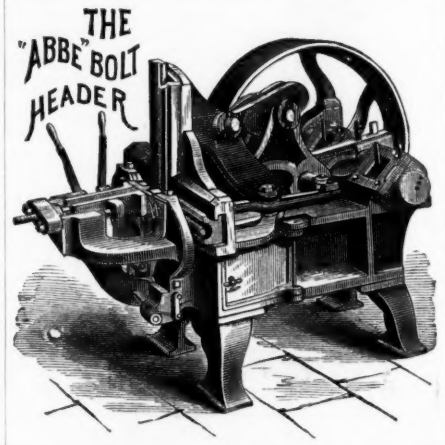

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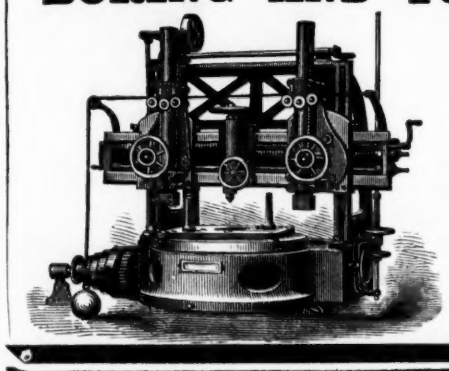

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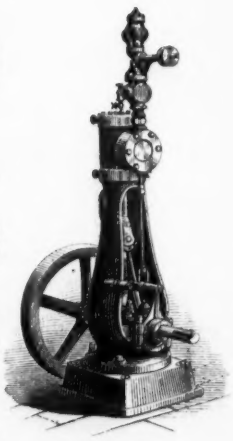

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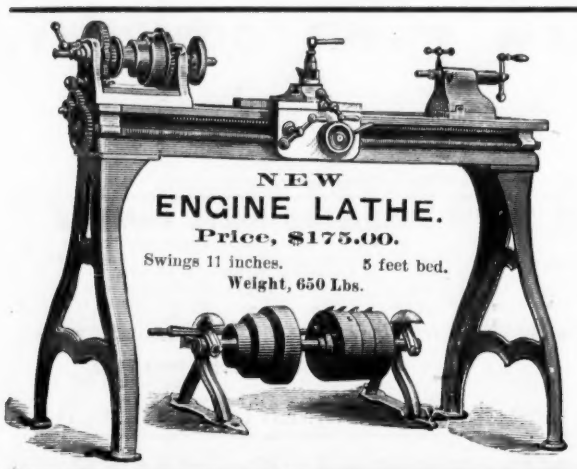

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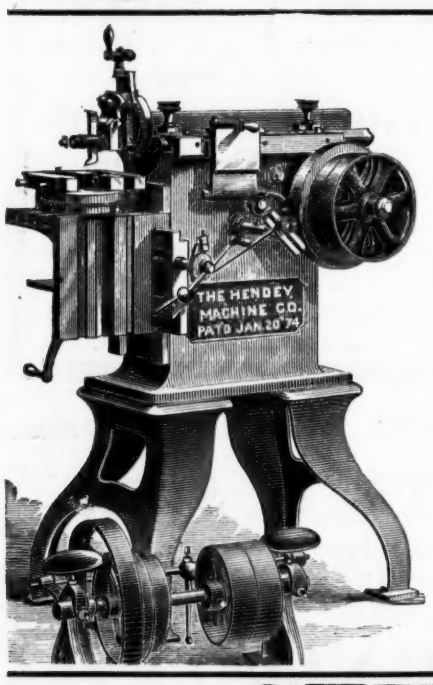

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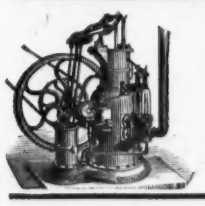

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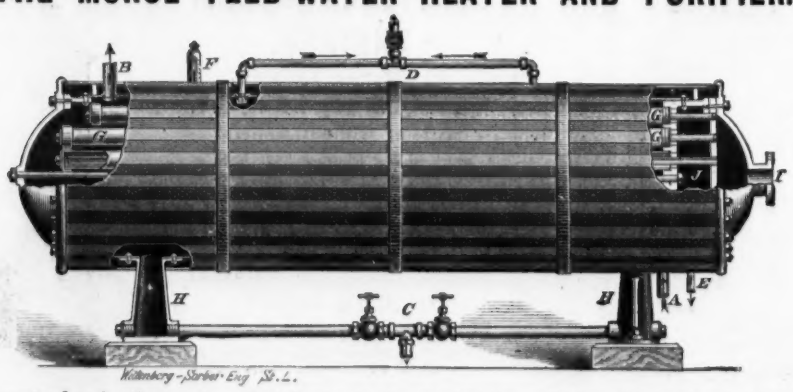

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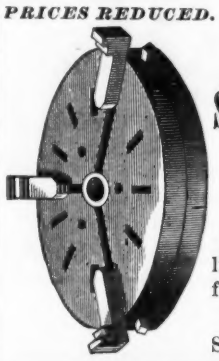

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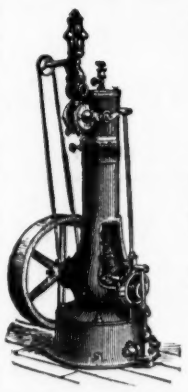

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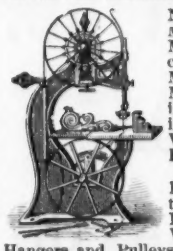

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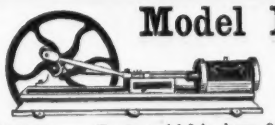

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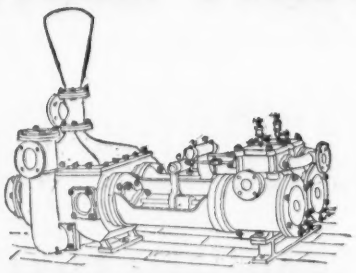

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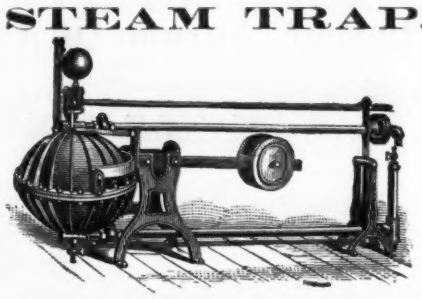

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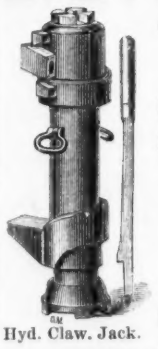

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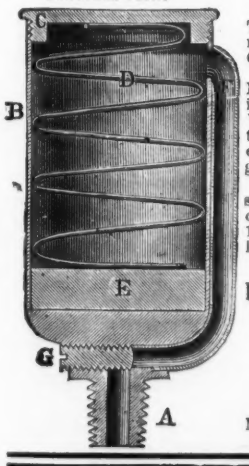

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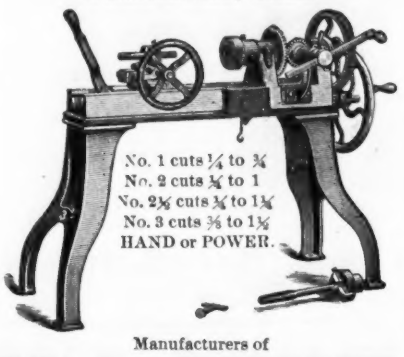

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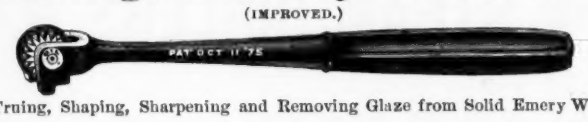

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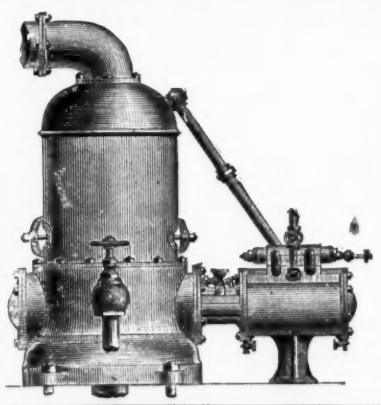

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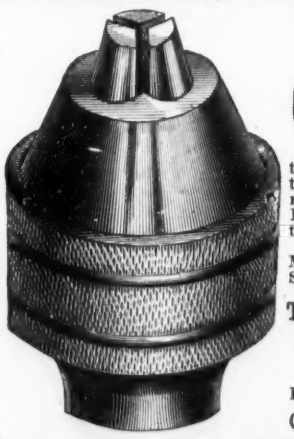

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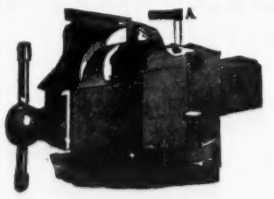

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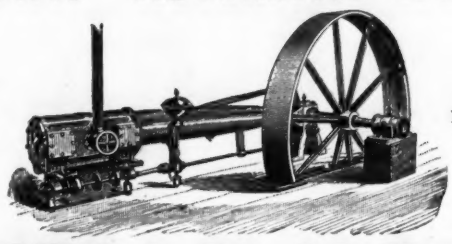

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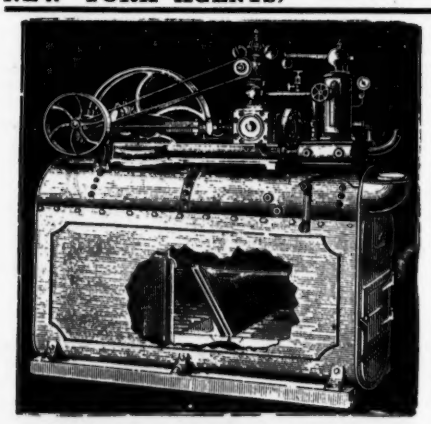

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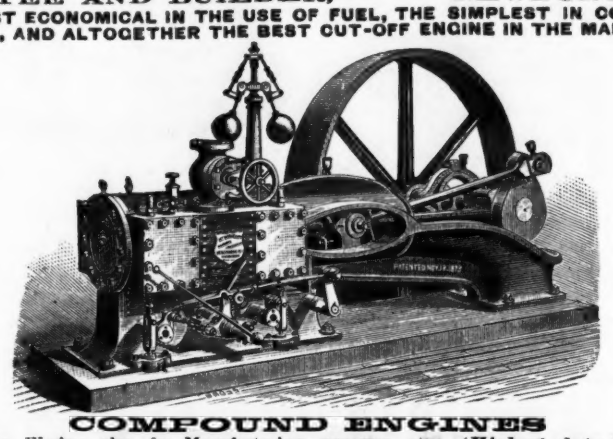
THE MOST ECONOMICAL IN THE USE OF FUEL, THE SIMPLEST IN CONSTRUCTION, AND ALTOGETHER THE BEST CUT-OFF ENGINE IN THE MARKET.



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Send for new Illustrated Circular, giving full description, and convincing testimonials, of which the following is a specimen:

U. S. Engineer's Office,
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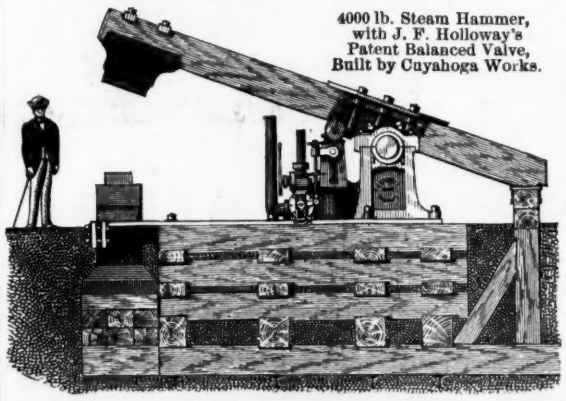
Messrs. Heald, Sisco & Co., Baldwinsville, N. Y.

Gentlemen:—In reply to your letter of the 19th instant, I have to say that we have had one of your "Reliable" horizontal engines at work since the middle of October, 1878, up to the present time. It has been used for driving one of your No. 10 Centrifugal Vertical Pumps, and has given us entire satisfaction. The only repairs necessary has been the replacing of the piston packing once.

Yours truly, T. A. MAHAN,
1st Lieut. Engineers.

[We desire to call particular attention to the above letter, as since it was received by us, Lieut. Mahan has confirmed his good opinion of our Engines therein expressed, by ordering two more of them.]

CUYAHOGA WORKS



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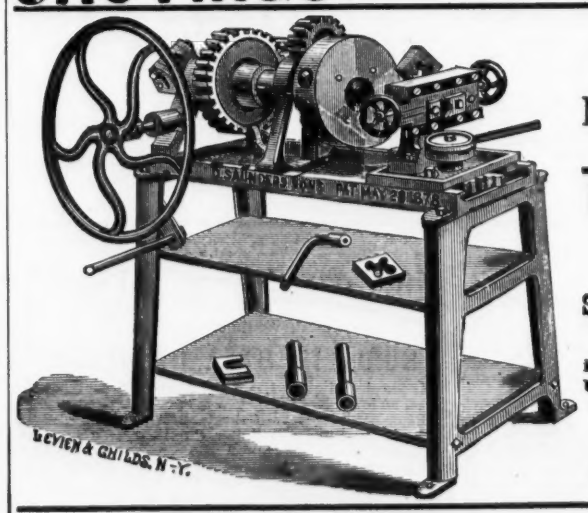

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The I.X.L.
FOR HAND OR POWER.
Manufacturers of
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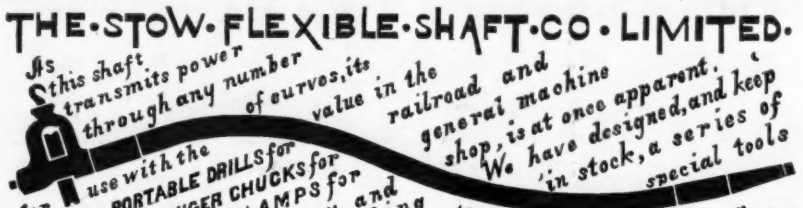
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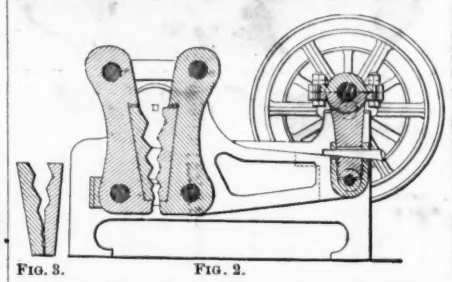

FIG. 3. FIG. 2.

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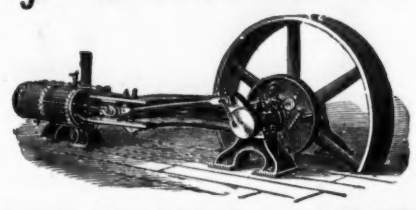

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Great Saving of Fuel.

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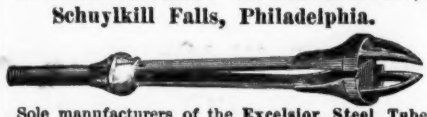

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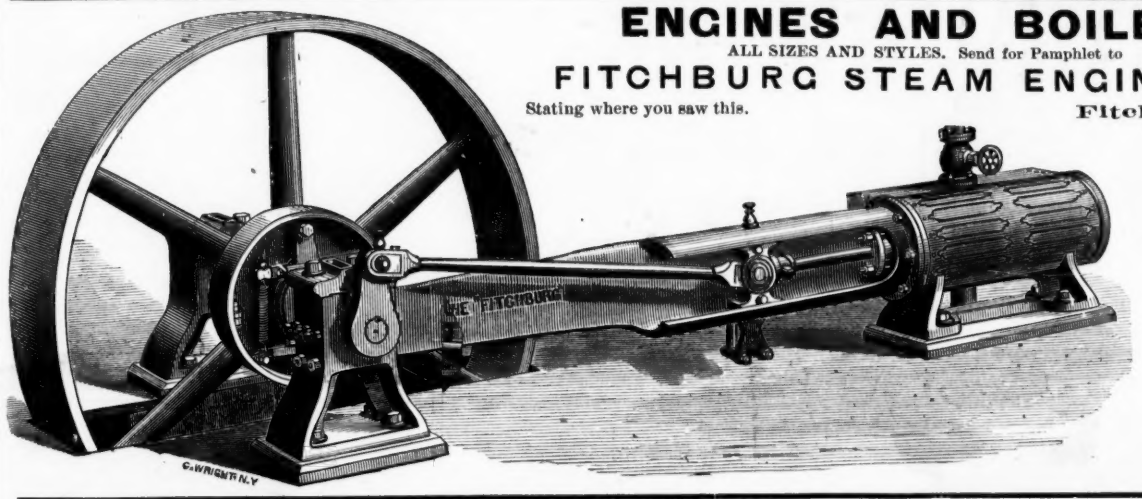

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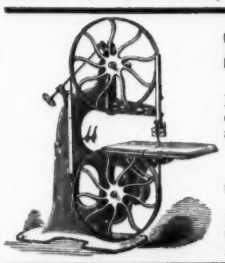

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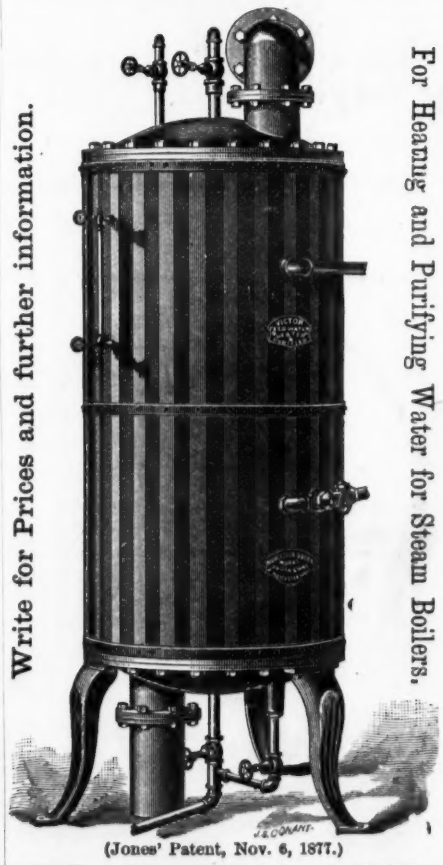

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Write for Prices and further information.

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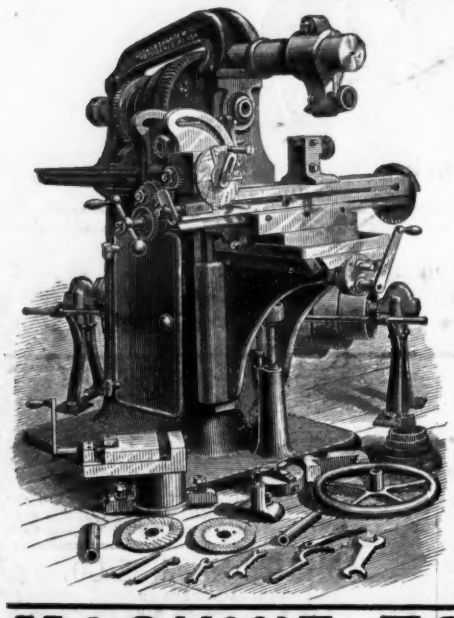

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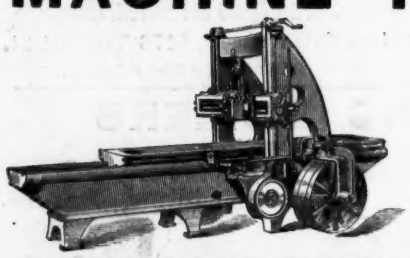

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For Feeding Steam Boilers, Filling Reservoirs and Tanks, and for General Pumping.

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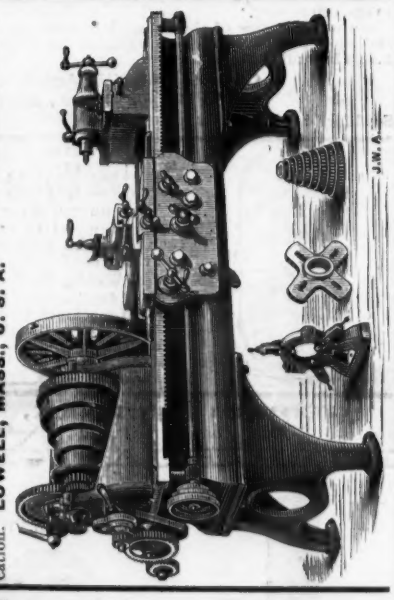

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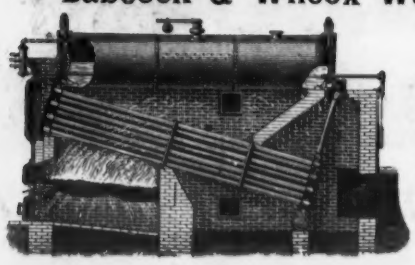

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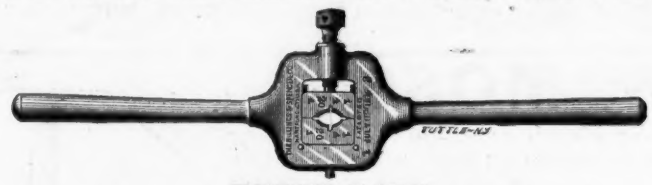

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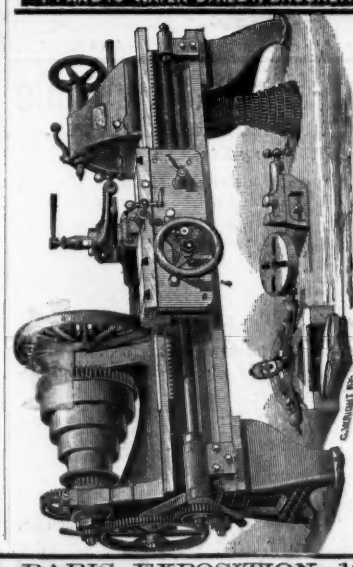

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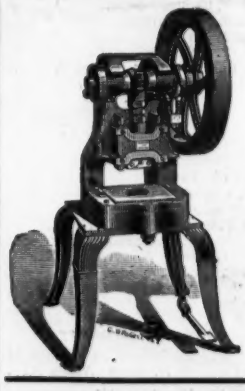

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